7.6 EXCEDENTE DO CONSUMIDOR E EXCEDENTE DO PRODUTOR

EXERCÍCIOS 7.6 PÁGINA 309 DO LIVRO MATEMÁTICA APLICADA À ECONOMIA E ADMINISTRAÇÃO (LOUIS LEITHOLD, EDITORA HARBRA)

1) $100p = 2.500 - 20x - x^2$ $\bar{p} = 16$

$EC = \int_0^{\bar{x}} f(x)\,dx - \bar{x}\bar{p}$ OU $EC = \int_{\bar{p}}^{b} g(p)\,dp$ $\quad b = f(0)$

$100p = 2.400 - 20x - x^2$

$100(16) = 2.400 - 20x - x^2$

$1.600 = 2.400 - 20x - x^2$

$x^2 + 20x - 2.400 + 1.600 = 0$

$x^2 + 20x - 800 = 0$

$100p = 2.400 - 20x - x^2$

$p = \dfrac{2.400 - 20x - x^2}{100}$

$\Delta = B^2 - 4AC$

$\Delta = (20)^2 - 4(1)(-800)$

$\Delta = 400 + 3.200$

$\Delta = 3.600$

$x = \dfrac{-b \pm \sqrt{\Delta}}{2A}$

$x = \dfrac{-20 \pm 60}{2.1}$

$x = \dfrac{-20 \pm 60}{2} \begin{cases} 20 \\ -40 \end{cases}$ $\quad \bar{x} = 20$

$EC = \int_0^{20} \left(\dfrac{2.400 - 20x - x^2}{100}\right) dx - 20(16)$

$F(x) = \int \left(\dfrac{2.400 - 20x - x^2}{100}\right) dx$

$F(x) = \int \dfrac{1}{100}(2.400 - 20x - x^2)\,dx$

$F(x) = \dfrac{1}{100}\int (2.400 - 20x - x^2)\,dx$

$F(x) = \dfrac{1}{100}\left(\int 2.400\,dx - \int 20x\,dx - \int x^2\,dx\right)$

$F(x) = \dfrac{1}{100}\left(2.400\int dx - 20\int x\,dx - \int x^2\,dx\right)$

$F(x) = \dfrac{1}{100}\left(2.400x - 20\dfrac{x^{1+1}}{1+1} - \dfrac{x^{2+1}}{2+1}\right) + C$

$F(x) = \dfrac{1}{100}\left(2.400x - 20\dfrac{x^2}{2_1} - \dfrac{x^3}{3}\right) + C$

$F(x) = \dfrac{1}{100}\left(2.400x + 10x^2 - \dfrac{x^3}{3}\right) + C$

$F(x) = 24x - \dfrac{x^2}{10} - \dfrac{x^3}{300} + C$

16) 1

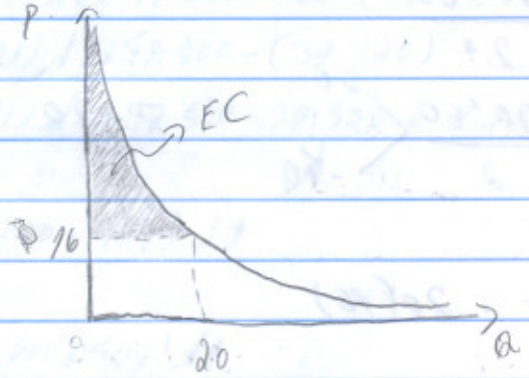
$$EC = 24x - \frac{x^2}{10} - \frac{x^3}{300}\Big|_0^{20} - 320$$

$$EC = 24(20) - \frac{(20)^2}{10} - \frac{(20)^3}{300} - \left(24(0) - \frac{(0)^2}{10} - \frac{(0)^3}{300}\right) - 320$$

$$EC = 480 - \frac{400}{10} - \frac{8.000}{300} - (0) - 320$$

$$EC = 480 - 40 - \frac{80}{3} - 320$$

$$EC = \frac{1.440 - 120 - 80 - 960}{3} = \frac{280}{3}$$



2) $10p = 3\sqrt{1.600 - 2x}$ $\quad \bar{x} = 700$

$EC = \int_0^{\bar{x}} f(x)\,dx - \bar{x}\bar{p}$ ou $EC = \int_{\bar{p}}^{b} g(p)\,dp$ $\quad b = f(0)$

$$10p = 3\sqrt{1.600 - 2x}$$

$$p = \frac{3\sqrt{1.600 - 2x}}{10}$$

$10p = 3\sqrt{1.600 - 2x}$

$10p = 3\sqrt{1.600 - 2(700)}$

$10p = 3\sqrt{1.600 - 1.400}$

$10p = 3\sqrt{200}$

$10p = 3\sqrt{2(100)}$

$10p = 3.10\sqrt{2}$

$p = \frac{3.10\sqrt{2}}{10}$

$\bar{p} = 3\sqrt{2}$

$$EC = \int_0^{700} \left(\frac{3\sqrt{1.600-2x}}{10} \right) dx - 700(3\sqrt{2})$$

$$F(x) = \int \left(\frac{3\sqrt{1.600-2x}}{10} \right) dx$$

$$F(x) = \int \frac{3}{10} \left(\sqrt{1.600-2x} \right) dx$$

$$F(x) = \frac{3}{10} \int \sqrt{1.600-2x}\, dx \qquad u = 1.600-2x \qquad \frac{du}{dx} = -2$$

$$F(x) = \frac{3}{10} \int \sqrt{u}\, \frac{du}{-2} \qquad du = -2dx \qquad dx = \frac{du}{-2}$$

$$F(x) = \frac{3}{10} \int -\frac{1}{2} u^{1/2}\, du$$

$$F(x) = \frac{3}{10}\left(-\frac{1}{2}\right) \int u^{1/2}\, du$$

$$F(x) = \frac{-3}{20} \frac{u^{1/2+1}}{1/2+1} + C$$

$$F(x) = \frac{-3}{20} \frac{u^{3/2}}{3/2} + C$$

$$\rightarrow F(x) = -\frac{3}{20} \cdot \frac{2}{3} u^{3/2} + C$$

$$F(x) = -\frac{1}{10} u^{3/2} + C$$

$$F(x) = -\frac{1}{10} (1.600-2x)^{3/2} + C$$

$$EC = -\frac{1}{10}(1.600-2x)^{3/2} \Big|_0^{700} - 2.100\sqrt{2}$$

$$EC = -\frac{1}{10}(1.600-2(700))^{3/2} - \left(-\frac{1}{10}(1.600-2(0))^{3/2}\right) - 2.100\sqrt{2}$$

$$EC = -\frac{1}{10}(1.600-1.400)^{3/2} - \left(-\frac{1}{10}(1.600-0)^{3/2}\right) - 2.100\sqrt{2}$$

$$EC = -\frac{1}{10}(200)^{3/2} - \left(-\frac{1}{10}(1.600)^{3/2}\right) - 2.100\sqrt{2}$$

$$EC = -\frac{1}{10}\sqrt{(200)^3} + \frac{1}{10}\sqrt{(1.600)^3} - 2.100\sqrt{2}$$

166

$$EC = -\frac{1}{10}\sqrt{(2\cdot 10^2)^3} + \frac{1}{10}\sqrt{(2^6\cdot 10^2)^3} - 2.100\sqrt{2}$$

$$EC = -\frac{1}{10}\sqrt{2^3\cdot 10^6} + \frac{1}{10}\sqrt{2^{12}\cdot 10^6} - 2.100\sqrt{2}$$

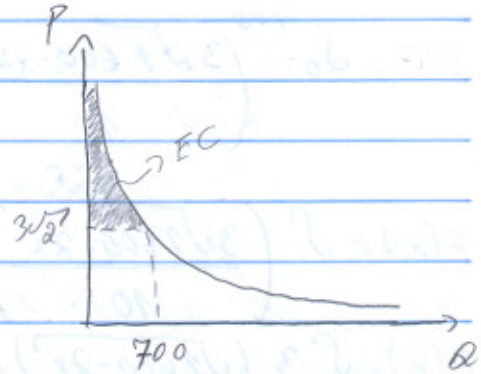
$$EC = -\frac{1}{10}\cdot 10^3\sqrt{2.2^2} + \frac{1}{10}\,2^6\cdot 10^3 - 2.100\sqrt{2}$$

$$EC = -1(10^2)(2\sqrt{2}) + 1(64)(10^2) - 2.100\sqrt{2}$$

$$EC = -1(100)(2\sqrt{2}) + 64(100) - 2.100\sqrt{2}$$

$$EC = -200\sqrt{2} + 6.400 - 2.100\sqrt{2}$$

$$EC = 6.400 - 2.300\sqrt{2}$$



3) $2x^2 - 300p + 900 = 0$ $\qquad \bar{p} = 9$

$EP = \bar{x}\bar{p} - \int_0^{\bar{x}} f(x)\,dx$ ou $EP = \int_a^{\bar{p}} g(p)\,dp$ $\quad a = f(0)$

$2x^2 - 300p + 900 = 0$

$-300p = -2x^2 - 900 \quad (-1)$

$300p = 2x^2 - 900$

$p = \frac{2x^2 - 900}{300}$

$2x^2 - 300p + 900 = 0$

$2x^2 - 300(9) + 900 = 0$

$2x^2 - 2.700 + 900 = 0$

$2x^2 - 1800 = 0$

$2x^2 = 1800$

$x^2 = \frac{1.800}{2}$ $\quad x^2 = 900$

$\bar{x} = +30$ E ~~-30~~

$EP = \bar{x}\bar{p} - \left[\int_0^{\bar{x}} f(x)\,dx\right]$

$EP = 30(9) - \left[\int_0^{30} \left(\frac{2x^2 - 900}{300}\right) dx\right]$

$F(x) = \int \left(\frac{2x^2 - 900}{300}\right) dx$

$$F(x) = \int_{300}^{2} \frac{1}{150}(x^2 - 450)\,dx$$

$$F(x) = \int \frac{1}{150}(x^2 - 450)\,dx$$

$$F(x) = \frac{1}{150}\int (x^2 - 450)\,dx$$

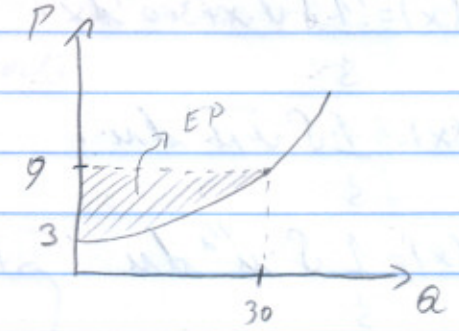
$$F(x) = \frac{1}{150}\left(\int x^2\,dx - \int 450\,dx\right)$$

$$F(x) = \frac{1}{150}\left(\int x^2\,dx - 450\int dx\right)$$

$$F(x) = \frac{1}{150}\left(\frac{x^{2+1}}{2+1} - 450x\right) + C$$

$$F(x) = \frac{1}{150}\left(\frac{x^3}{3} - 450x\right) + C$$

$$F(x) = \frac{x^3}{450} - 3x + C$$



$$EP = 270 - \left(\frac{x^3}{450} - 3x\Big|_0^{30}\right)$$

$$EP = 270 - \left[\frac{(30)^3}{450} - 3(30) - \left(\frac{(0)^3}{450} - 3(0)\right)\right]$$

$$EP = 270 - \left[\frac{27.000}{450} - 90 - 0\right]$$

$$EP = 270 - (60 - 90)$$

$$EP = 270 - (-30) = 270 + 30 = 300$$

(1) $10p = 2\sqrt{x+300}$ $\quad \bar{p} = 8$

$EP = \bar{x}\bar{p} - \int_0^{\bar{x}} f(x)\,dx$ ou $EP = \int_a^{\bar{p}} g(p)\,dp$ $\quad a = f(0)$

$$10p = 2\sqrt{x+300}$$

$$p = \frac{2\sqrt{x+300}}{10}$$

$$p = \frac{\sqrt{x+300}}{5}$$

$$10p = 2\sqrt{x+300}$$

$$10(8) = 2\sqrt{x+300}$$

$$80 = 2\sqrt{x+300}$$

$$\frac{80}{2} = \sqrt{x+300}$$

$$(\sqrt{x+300})^2 = (40)^2$$

$$x + 300 = 1.600$$

$$x = 1.600 - 300$$

$$\bar{x} = 1.300$$

168 |

$$EP = \bar{x}\bar{p} - \int_0^{1.300} \left(\frac{\sqrt{x+300}}{5}\right) dx$$

$$F(x) = \int \left(\frac{\sqrt{x+300}}{5}\right) dx$$

$$F(x) = \int \frac{1}{5} \left(\sqrt{x+300}\right) dx$$

$$F(x) = \frac{1}{5} \int \sqrt{x+300}\, dx \qquad u = x+300 \quad \frac{du}{dx} = 1 \quad du = dx$$

$$F(x) = \frac{1}{5} \int \sqrt{u}\, du$$

$$F(x) = \frac{1}{5} \int u^{1/2} du$$

$$F(x) = \frac{1}{5} \frac{u^{1/2+1}}{1/2+1} + C$$

$$F(x) = \frac{1}{5} \frac{u^{3/2}}{3/2} + C$$

$$F(x) = \frac{1}{5} \cdot \frac{2}{3} u^{3/2} + C$$

$$F(x) = \frac{2}{15} u^{3/2} + C$$

$$F(x) = \frac{2}{15} (x+300)^{3/2} + C$$

$$EP = 1.300(P) - \left[\frac{2}{15}(x+300)^{3/2} \Big|_0^{1.300}\right]$$

$$EP = 10.500 - \left[\frac{2}{15}(1.300+300)^{3/2} - \left(\frac{2}{15}(0+300)^{3/2}\right)\right]$$

$$EP = 10.500 - \left[\frac{2}{15}(1.600)^{3/2} - \left(\frac{2}{15}(300)^{3/2}\right)\right]$$

$$EP = 10.500 - \left[\frac{2}{15}\sqrt{1600^3} - \left(\frac{2}{15}\sqrt{(300)^3}\right)\right]$$

$$EP = 10.500 - \left[\frac{2}{15}\sqrt{(2^5 \cdot 10^2)^3} - \left(\frac{2}{15}\sqrt{(3 \cdot 10^2)^3}\right)\right]$$

$$EP = 10.500 - \left[\frac{2}{15}\sqrt{2^{12} \cdot 10^6} - \left(\frac{2}{15}\sqrt{3^3 \cdot 10^6}\right)\right]$$

$EP = 10.400 - \left[\frac{2}{15}(2^6)(10^3) - \left(\frac{2}{15}(10^3)\sqrt{3^3}\right)\right]$

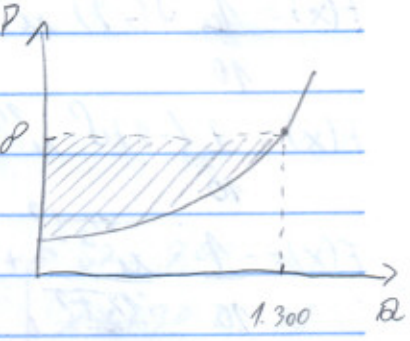
$EP = 10.400 - \left[\frac{2}{15}(64.000) - \left(\frac{2}{15}(1.000)(3\sqrt{3})\right)\right]$

$EP = 10.400 - \left[8.533,33 - \left(\frac{6.000\sqrt{3}}{15}\right)\right]$

$EP = 10.400 - [8.533,33 - (400\sqrt{3})]$

$EP = 10.400 - [8.533,33 - 400\sqrt{3}]$

$EP = 10.400 - 8.533,33 + 400\sqrt{3} = 1.866,70 + 400\sqrt{3}$



(5) $10p = \sqrt{900 - x}$ $\quad \bar{x} = 300$

$EC = \int_0^{\bar{x}} f(x)\,dx - \bar{x}\bar{p}$

$10p = \sqrt{900-x}$

$p = \frac{\sqrt{900-x}}{10}$

$10\bar{p} = \sqrt{900-\bar{x}}$

$10\bar{p} = \sqrt{900-300}$

$10\bar{p} = \sqrt{600}$

$10\bar{p} = 20$

$\bar{p} = \frac{20}{10}$

$\bar{p} = 2$

$EC = \int_0^{300} \frac{\sqrt{900-x}}{10}\,dx - \bar{x}\bar{p}$

$F(x) = \int \frac{\sqrt{900-x}}{10}\,dx$

$F(x) = \int \frac{1}{10}\sqrt{900-x}\,dx$

$F(x) = \frac{1}{10}\int \sqrt{900-x}\,dx$ $\quad u = 900 - x$ $\quad \frac{du}{dx} = -1$

$F(x) = \frac{1}{10}\int \sqrt{u}\,(-du)$ $\quad du = -dx$

$dx = -du$

170)

$$F(x) = \frac{1}{10}\int (-1)\, u^{1/2}\, du \rightarrow F(x) = -\frac{1}{10}\,\frac{u^{3/2}}{3/2} + C \rightarrow F(x) = -\frac{1}{15}(900-x)^{3/2} + C$$

$$F(x) = \frac{1}{10}(-1)\int u^{1/2}\, du \quad F(x) = -\frac{1}{10}\cdot\frac{2}{3}\, u^{3/2} + C$$

$$F(x) = -\frac{1}{10}\,\frac{u^{1/2+1}}{1/2+1} + C \quad F(x) = -\frac{1}{15}\, u^{3/2} + C$$

$$EC = \left(-\frac{1}{15}(900-x)^{3/2}\,\middle|_{0}^{300}\right) - 300(2)$$

$$EC = \left[-\frac{1}{15}(900-300)^{3/2} - \left(-\frac{1}{15}(900-0)^{3/2}\right)\right] - 1.000$$

$$EC = \left[-\frac{1}{15}(600)^{3/2} - \left(-\frac{1}{15}(900)^{3/2}\right)\right] - 1.000$$

$$EC = \left[-\frac{1}{15}\sqrt{(600)^3} - \left(-\frac{1}{15}\sqrt{(900)^3}\right)\right] - 1.000$$

$$EC = \left[-\frac{1}{15}\sqrt{(2^2\cdot 10^2)^3} - \left(-\frac{1}{15}\sqrt{(3^2\cdot 10^2)^3}\right)\right] - 1.000$$

$$EC = \left[-\frac{1}{15}\sqrt{2^6\cdot 10^6} - \left(-\frac{1}{15}\sqrt{3^6\cdot 10^6}\right)\right] - 1.000$$

$$EC = \left[-\frac{1}{15}(2^3)(10^3) - \left(-\frac{1}{15}(3^3)(10^3)\right)\right] - 1.000$$

$$EC = \left[-\frac{1}{15}(8.000) - \left(-\frac{1}{15}(27.000)\right)\right] - 1.000$$

$$EC = \left[-\frac{8.000}{15} - \left(-\frac{27.000}{15}\right)\right] - 1.000$$

$$EC = \left(-\frac{8.000}{15} + \frac{27000}{15}\right) - 1.000$$

$$EC = \frac{19.000}{15} - 1.000 = \frac{19.000 - 15.000}{15} = \frac{4.000}{15} = 266,67$$

(6) $x^2 + 100p = 2.500$ $\quad \bar{p} = 16$

$EC = \int_0^{\bar{x}} f(x)\,dx - \bar{x}\bar{p}$

$100p = 2.500 - x^2$

$p = \frac{2.500 - x^2}{100}$

$100p = 2.500 - x^2$

$100(16) = 2.500 - x^2$

$1.600 = 2.500 - x^2$

$x^2 = 2.500 - 1.600$

$x^2 = 900$

$\bar{x} = \pm 30$ E -30

$EC = \int_0^{30} \left(\frac{2.500 - x^2}{100}\right) dx - 30(16)$

$F(x) = \int \left(\frac{2.500 - x^2}{100}\right) dx$

$F(x) = \int \frac{1}{100} (2.500 - x^2)\,dx$

$F(x) = \frac{1}{100} \int (2.500 - x^2)\,dx$

$F(x) = \frac{1}{100} \left(\int 2.500\,dx - \int x^2\,dx\right)$

$F(x) = \frac{1}{100} \left(2.500 \int dx - \int x^2\,dx\right)$

$F(x) = \frac{1}{100} \left(2.500x - \frac{x^{2+1}}{2+1}\right) + C$

$F(x) = \frac{1}{100} \left(2.500x - \frac{x^3}{3}\right) + C$

$F(x) = 25x - \frac{x^3}{300} + C$

$EC = 25x - \frac{x^3}{300} \Big|_0^{30} - 480$

$EC = 25(30) - \frac{(30)^3}{300} - \left(25(0) - \frac{(0)^3}{300}\right) - 480$

$EC = 750 - \frac{27.000}{300} - 0 - 480$

$EC = 750 - 90 - 480$

$EC = 180$

1721

(7) $10p = \sqrt{900 - x}$ $\quad \bar{x} = 500$

$EC = \int_{\bar{p}}^{b} g(p)\,dp \qquad b = f(0)$

$10p = \sqrt{900 - x}$

$(10p)^2 = (\sqrt{900 - x})^2$

$100p^2 = 900 - x$

$x = 900 - 100p^2$

$10\bar{p} = \sqrt{900 - \bar{x}}$

$10\bar{p} = \sqrt{900 - 500}$

$10\bar{p} = \sqrt{400}$

$10\bar{p} = 20$

$\bar{p} = \frac{20}{10}$

$\bar{p} = 2$

$10p = \sqrt{900 - x}$

$10p = \sqrt{900 - 0}$

$10p = \sqrt{900}$

$10p = 30$

$p = \frac{30}{10}$

$p = 3 = b$

$EC = \int_{2}^{3} (900 - 100p^2)\,dp$

$F(p) = \int (900 - 100p^2)\,dp$

$F(p) = \int 900\,dp - \int 100p^2\,dp$

$F(p) = 900\int dp - 100\int p^2\,dp$

$F(p) = 900p - 100\frac{p^{2+1}}{2+1} + C$

$F(p) = 900p - \frac{100}{3}p^3 + C$

$EC = 900p - \frac{100}{3}p^3 \Big|_2^3$

$EC = 900(3) - \frac{100}{3}(3)^3 - \left(900(2) - \frac{100}{3}(2)^3\right)$

$EC = 2.700 - \frac{100}{3}(27) - \left(1.800 - \frac{100}{3}(8)\right)$

$EC = 2.700 - 100(9) - \left(1.800 - \frac{800}{3}\right)$

$EC = 2.700 - 900 - \left(\frac{5.400 - 800}{3}\right)$

$EC = 1.800 - \left(\frac{4.600}{3}\right)$

$EC = 1.800 - \frac{4.600}{3}$

$EC = \frac{5.400 - 4.600}{3}$

$EC = \frac{800}{3} = 266,67$

(8) $x^2 + 100p = 2.500$ $\quad \bar{p} = 16$

$EC = \int_{\bar{p}}^{b} g(p)\,dp$ $\quad b = f(0)$

$x^2 + 100p = 2.500$
$x^2 = 2.500 - 100p$
$x = \sqrt{2.500 - 100p}$
$x = \sqrt{100(25 - p)}$
$x = 10\sqrt{25 - p}$

$x^2 + 100p = 2.500$
$(0)^2 + 100p = 2.500$
$100p = 2.500$
$p = \frac{2.500}{100}^{25}$
$p = 25 = b$

$EC = \int_{16}^{25} (10\sqrt{25 - p})\,dp$

$F(p) = \int 10\sqrt{25 - p}\,dp$
$F(p) = 10 \int \sqrt{25 - p}\,dp$ $\quad u = 25 - p$ $\quad \frac{du}{dp} = -1$
$F(p) = 10 \int \sqrt{u}\,(-du)$ $\quad du = -dp$
$F(p) = 10 \int (-1) u^{1/2}\,du$ $\quad dp = -du$
$F(p) = 10(-1) \int u^{1/2}\,du$
$F(p) = -10\,\frac{u^{1/2+1}}{1/2+1} + C$
$F(p) = -10\,\frac{u^{3/2}}{3/2} + C$
$F(p) = -10 \cdot \frac{2}{3}\,u^{3/2} + C$
$F(p) = -\frac{20}{3}\,u^{3/2} + C$

$F(p) = -\frac{20}{3}(25 - p)^{3/2} + C$

$EC = -\frac{20}{3}(25 - p)^{3/2} \Big|_{16}^{25}$
$EC = -\frac{20}{3}(25 - 25)^{3/2} - \left(-\frac{20}{3}(25 - 16)^{3/2}\right)$

(171)

$$EC = -\frac{20}{3}(0)^{3/2} - \left(-\frac{20}{3}(9)^{3/2}\right)$$

$$EC = 0 - \left(-\frac{20}{3}\sqrt{9^3}\right)$$

$$EC = -\left(-\frac{20}{3}\sqrt{(3^2)^3}\right)$$

$$EC = \frac{20}{3}\sqrt{3^6}$$

$$EC = \frac{20}{3}(3^3)$$

$$EC = \frac{20}{3_1}\left(\cancel{27}^{9}\right) = 20 \cdot 9 = 180$$

(9) $100p = (x+20)^2$ $\quad \bar{p} = 25$

$$EP = \bar{x}\cdot\bar{p} - \int_0^{\bar{x}} f(x)\,dx$$

$$100p = (x+20)^2$$

$$p = \frac{(x+20)^2}{100}$$

$$p = \frac{x^2+50x+500}{100}$$

$$100\bar{p} = (\bar{x}+20)^2$$

$$100(25) = \bar{x}^2+50\bar{x}+500$$

$$2500 = \bar{x}^2+50\bar{x}+500$$

$$\bar{x}^2+50\bar{x}+500-2500 = 0$$

$$\bar{x}^2+50\bar{x}-2000 = 0$$

$$\Delta = B^2-4AC$$

$$\Delta = (50)^2-4(1)(-2000)$$

$$\Delta = 2500+8000$$

$$\Delta = 10.000$$

$$\bar{x} = \frac{-b\pm\sqrt{\Delta}}{2A}$$

$$\bar{x} = \frac{-(50)\pm 100}{2(1)}$$

$$\bar{x} = \frac{-50\pm 100}{2} \rightarrow 30 \quad \cancel{-150}$$

$$EP = 30(25) - \int_0^{30}\left(\frac{x^2+50x+500}{100}\right)dx$$

$$F(x) = \int\left(\frac{x^2+50x+500}{100}\right)dx$$

$$F(x) = \int \frac{1}{100}(x^2+50x+500)\,dx$$

FORONI

$$F(x) = \frac{1}{100}\int (x^2 + 40x + 400)\,dx$$

$$F(x) = \frac{1}{100}\left(\int x^2\,dx + \int 40x\,dx + \int 400\,dx\right)$$

$$F(x) = \frac{1}{100}\left(\int x^2\,dx + 40\int x\,dx + 400\int dx\right)$$

$$F(x) = \frac{1}{100}\left(\frac{x^{2+1}}{2+1} + 40\frac{x^{1+1}}{1+1} + 400x\right) + C$$

$$F(x) = \frac{1}{100}\left(\frac{x^3}{3} + 40\frac{x^2}{2} + 400x\right) + C$$

$$F(x) = \frac{1}{100}\left(\frac{x^3}{3} + 20x^2 + 400x\right) + C$$

$$F(x) = \frac{x^3}{300} + \frac{x^2}{5} + 4x + C$$

$$EP = 750 - \left[\frac{x^3}{300} + \frac{x^2}{5} + 4x \,\middle|_{0}^{30}\right]$$

$$EP = 750 - \left[\frac{(30)^3}{300} + \frac{(30)^2}{5} + 4(30) - \left(\frac{(0)^3}{300} + \frac{(0)^2}{5} + 4(0)\right)\right]$$

$$EP = 750 - \left[\frac{27.000}{300} + \frac{900}{5} + 120 - 0\right]$$

$$EP = 750 - (90 + 180 + 120)$$

$$EP = 750 - (390) = 750 - 390 = 360$$

(10) $x^2 - 200p + 900 = 0 \qquad \bar{x} = 30$

$$EP = \bar{x}\bar{p} - \int_0^{\bar{x}} f(x)\,dx$$

$$x^2 - 200p + 900 = 0 \quad \int \quad p = \frac{-x^2 - 900}{-200} \Rightarrow p = \frac{x^2 + 900}{200}$$

$$-200p = -x^2 - 900$$

176

$\bar{x}^2 - 200\bar{p} + 900 = 0$

$(30)^2 - 200\bar{p} + 900 = 0$

$900 - 200\bar{p} + 900 = 0$

$-200\bar{p} + 1800 = 0$

$-200\bar{p} = -1800$

$\bar{p} = \frac{-1800}{-200}$

$\bar{p} = 9$

$EP = 30(9) - \left[\int_0^{30} \frac{x^2+900}{200}\,dx\right]$

$F(x) = \int \frac{x^2+900}{200}\,dx$

$F(x) = \int \frac{1}{200}(x^2+900)\,dx$

$F(x) = \frac{1}{200}\int (x^2+900)\,dx$

$F(x) = \frac{1}{200}\left(\int x^2\,dx + \int 900\,dx\right)$

$F(x) = \frac{1}{200}\left(\int x^2\,dx + 900\int dx\right)$

$F(x) = \frac{1}{200}\left(\frac{x^{2+1}}{2+1} + 900x\right) + C$

$F(x) = \frac{1}{200}\left(\frac{x^3}{3} + 900x\right) + C$

$F(x) = \frac{x^3}{600} + \frac{9}{2}x + C$

$EP = 270 - \left[\frac{x^3}{600} + \frac{9}{2}x\Big|_0^{30}\right]$

$EP = 270 - \left[\frac{(30)^3}{600} + \frac{9}{2}(30) - \left(\frac{(0)^3}{600} - \frac{9}{2}(0)\right)\right]$

$EP = 270 - \left[\frac{27.000}{600} + \frac{270}{2} - 0\right]$

$EP = 270 - (45 + 135)$

$EP = 270 - (180) = 270 - 180 = 90$

11) $100p = (x+20)^2$ $\quad \bar{p} = 25$

$EP = \int_a^{\bar{p}} g(p)\,dp$ $\quad a = 1(0)$

$100p = (x+20)^2$

$x+20 = \sqrt{100p}$

$x+20 = 10\sqrt{p}$

$x = 10\sqrt{p} - 20$

$EP = \int_4^{25} (10\sqrt{p} - 20)\,dp$

$F(p) = \int (10\sqrt{p} - 20)\,dp$

$F(p) = \int 10\sqrt{p}\,dp - \int 20\,dp$

$F(p) = 10\int \sqrt{p}\,dp - 20\int dp$

$F(p) = 10\int p^{1/2}\,dp - 20\int dp$

$100p = (x+20)^2$

$100p = (0+20)^2$

$100p = (20)^2$

$100p = 400$

$p = \frac{400}{100}$

$p = 4 = a$

$F(p) = 10\frac{p^{1/2+1}}{1/2+1} - 20p + C$

$F(p) = 10\frac{p^{3/2}}{3/2} - 20p + C$

$F(p) = 10\left(\frac{2}{3}\right)p^{3/2} - 20p + C$

$F(p) = \frac{20}{3}p^{3/2} - 20p + C$

$EP = \frac{20}{3}p^{3/2} - 20p \Big|_4^{25}$

$EP = \frac{20}{3}(25)^{3/2} - 20(25) - \left(\frac{20}{3}(4)^{3/2} - 20(4)\right)$

$EP = \frac{20}{3}\sqrt{25^3} - 500 - \left(\frac{20}{3}\sqrt{4^3} - 80\right)$

$EP = \frac{20}{3}\sqrt{(5^2)^3} - 500 - \left(\frac{20}{3}\sqrt{(2^2)^3} - 80\right)$

$EP = \frac{20}{3}\sqrt{5^6} - 500 - \left(\frac{20}{3}\sqrt{2^6} - 80\right)$

$EP = \frac{20}{3}(5^3) - 500 - \left(\frac{20}{3}(2^3) - 80\right)$

$EP = \frac{20}{3}(125) - 500 - \left(\frac{20}{3}(8) - 80\right)$

$EP = \frac{2500}{3} - 500 - \left(\frac{160}{3} - 80\right)$

$EP = \frac{2500}{3} - 500 - \frac{160}{3} + 80$

$EP = \frac{2340}{3} - 420$

$EP = 780 - 420 = 360$

1781

(12) $x^2 - 200p + 900 = 0$ $\quad \bar{x} = 30$

$EP = \int_a^{\bar{p}} y(p)\,dp$ $\quad a = f(0)$

$x^2 = 200p - 900$

$x = \sqrt{200p - 900}$

$x = \sqrt{100(2p - 9)}$

$x = 10\sqrt{2p - 9}$

$\bar{x}^2 - 200\bar{p} + 900 = 0$

$(30)^2 - 200\bar{p} + 900 = 0$

$900 - 200\bar{p} + 900 = 0$

$-200\bar{p} + 1800 = 0$

$-200\bar{p} = -1800$

$\bar{p} = \frac{-1800}{-200}$

$\bar{p} = 9$

$x^2 - 200p + 900 = 0$

$(0)^2 - 200p + 900 = 0$

$-200p = -900$

$p = \frac{-900}{-200}$

$p = \frac{9}{2} = a$

$EP = \int_{\frac{9}{2}}^{9} 10\sqrt{2p - 9}\,dp$

$F(p) = \int 10\sqrt{2p - 9}\,dp$

$F(p) = 10 \int \sqrt{2p - 9}\,dp$

$u = 2p - 9$ $\quad \frac{du}{dp} = 2$

$du = 2\,dp$

$dp = \frac{du}{2}$

$F(p) = 10 \int \sqrt{u}\,\frac{du}{2}$

$F(p) = 10 \int \frac{1}{2} u^{1/2}\,du$

$F(p) = 10 \left(\frac{1}{2}\right) \int u^{1/2}\,du$

$F(p) = 5 \frac{u^{1/2+1}}{1/2+1} + C$

$F(p) = 5 \frac{u^{3/2}}{3/2} + C$

$F(p) = 5 \left(\frac{2}{3}\right) u^{3/2} + C$

$F(p) = \frac{10}{3} u^{3/2} + C$

$F(p) = \frac{10}{3} (2p - 9)^{3/2} + C$

$$EP = \frac{10}{3}(2p-9)^{3/2}\Big|_{9/2}^{9}$$

$$EP = \frac{10}{3}(2(9)-9)^{3/2} - \left[\frac{10}{3}\left(2\left(\frac{9}{2}\right)-9\right)^{3/2}\right]$$

$$EP = \frac{10}{3}(18-9)^{3/2} - \left[\frac{10}{3}(9-9)^{3/2}\right]$$

$$EP = \frac{10}{3}(9)^{3/2} - \left[\frac{10}{3}(0)^{3/2}\right]$$

$$EP = \frac{10}{3}\sqrt{9^3} - 0$$

$$EP = \frac{10}{3}\sqrt{(3^2)^3}$$

$$EP = \frac{10}{3}\sqrt{3^6}$$

$$EP = \frac{10}{3}(3^3)$$

$$EP = \frac{10}{3_1}(27^9)$$

$$EP = 90$$

(14) $x = 760 - p^2$ $\qquad x = p^2 - 40$

$$760 - \bar{p}^2 = \bar{p}^2 - 40$$
$$-\bar{p}^2 - \bar{p}^2 = -40 - 760$$
$$-2\bar{p}^2 = -800$$
$$\bar{p}^2 = \frac{-800}{-2}$$

$$\bar{p}^2 = 400$$
$$\bar{p} = \sqrt{400}$$
$$\bar{p} = +20 \quad E \quad -\cancel{20}$$

$$EC = \int_{\bar{p}}^{b} g(p)\,dp \qquad b = f(0)$$

$$x = 760 - p^2$$
$$0 = 760 - p^2$$
$$p^2 = 760$$
$$p = \sqrt{760} = b$$

$$EC = \int_{20}^{\sqrt{760}} (760 - p^2)\,dp$$

$$F(p) = \int (760 - p^2)\,dp$$
$$F(p) = \int 760\,dp - \int p^2\,dp$$

$$F(p) = 760\int dp - \int p^2\,dp$$

$$F(p) = 760p - \frac{p^{2+1}}{2+1} + C$$

$$F(p) = 760p - \frac{p^3}{3} + C$$

$$EC = 760p - \frac{p^3}{3}\Big|_{20}^{\sqrt{760}}$$

$$EC = 760\sqrt{760} - \frac{(\sqrt{760})^3}{3} - \left(760(20) - \frac{(20)^3}{3}\right)$$

$$EC = 760\sqrt{760} - \frac{((760)^{\frac{1}{2}})^3}{3} - \left(15.200 - \frac{8.000}{3}\right)$$

$$EC = 760\sqrt{760} - \frac{(760)^{\frac{3}{2}}}{3} - \left(\frac{45.600 - 8.000}{3}\right)$$

$$EC = 760\sqrt{760} - \frac{\sqrt{760^3}}{3} - \left(\frac{37.600}{3}\right)$$

$$EC = \frac{2.280\sqrt{760} - \sqrt{(760)^2 760}}{3} - \frac{37.600}{3}$$

$$EC = \frac{2.280\sqrt{760} - 760\sqrt{760} - 37.600}{3}$$

$$EC = \frac{1.520\sqrt{760} - 37.600}{3}$$

$$EP = \int_a^{\bar{p}} g(p)\,dp$$

$X = p^2 - 40$ $\qquad a = f(0)$

$$\left.\begin{array}{l} X = p^2 - 40 \\ 0 = p^2 - 40 \\ -p^2 = -40(-1) \end{array}\right\} \quad p^2 = 40 \quad p = \sqrt{40} = a$$

$$EP = \int_{\sqrt{40}}^{20} (p^2 - 40)\,dp$$

$$F(p) = \int (p^2 - 40)\,dp$$
$$F(p) = \int p^2\,dp - \int 40\,dp$$
$$F(p) = \int p^2\,dp - 40\int dp$$
$$F(p) = \frac{p^{2+1}}{2+1} - 40p + C \quad \Rightarrow F(p) = \frac{p^3}{3} - 40p + C$$

$$EP = \frac{p^3}{3} - 40p \Big|_{\sqrt{40}}^{20}$$

$$EP = \frac{(20)^3}{3} - 40(20) - \left(\frac{(\sqrt{40})^3}{3} - 40(\sqrt{40})\right)$$

$$EP = \frac{8.000}{3} - 800 - \left(\frac{((40)^{1/2})^3}{3} - 40\sqrt{40}\right)$$

$$EP = \frac{8.000 - 2.400}{3} - \left(\frac{40^{3/2}}{3} - 120\sqrt{40}\right)$$

$$EP = \frac{5.600}{3} - \left(\frac{\sqrt{40^3}}{3} - 120\sqrt{40}\right)$$

$$EP = \frac{5.600}{3} - \left(\frac{\sqrt{(40^2)40}}{3} - 120\sqrt{40}\right)$$

$$EP = \frac{5.600}{3} - \left(\frac{40\sqrt{40}}{3} - 120\sqrt{40}\right)$$

$$EP = \frac{5.600}{3} - \left(-\frac{80\sqrt{40}}{3}\right)$$

$$EP = \frac{5.600 + 80\sqrt{40}}{3}$$

(13) $100p = 2.400 - 20x - x^2$ $\qquad 2x^2 - 300p + 900 = 0$

$$p = \frac{2.400 - 20x - x^2}{100} \qquad -300p = -900 - 2x^2 \Rightarrow p = \frac{900 + 2x^2}{300}$$

$$p = \frac{-900 - 2x^2}{-300}$$

(22)

$$\frac{2.500 - 20\bar{x} - \bar{x}^2}{100} = \frac{900 + 2\bar{x}^2}{300}$$

$$\frac{7.200 - 60\bar{x} - 3\bar{x}^2}{300} = 900 + 2\bar{x}^2$$

$$7.200 - 60\bar{x} - 3\bar{x}^2 = 900 + 2\bar{x}^2$$

$$-3\bar{x}^2 - 2\bar{x}^2 - 60\bar{x} + 7.200 - 900 = 0$$

$$-5\bar{x}^2 - 60\bar{x} + 6.300 = 0 \quad (-1)$$

$$5\bar{x}^2 + 60\bar{x} - 6.300 = 0$$

$$\Delta = B^2 - 4AC$$

$$\Delta = (60)^2 - 4(5)(-6.300)$$

$$\Delta = 3.600 + 126.000$$

$$\Delta = 129.600$$

$$\bar{x} = \frac{-b \pm \sqrt{\Delta}}{2A}$$

$$\bar{x} = \frac{-60 \pm 360}{2(5)}$$

$$\bar{x} = \frac{-60 \pm 360}{10} \rightarrow 30 \text{ o } -42$$

$$2\bar{x}^2 - 300\bar{p} + 900 = 0$$

$$2(30)^2 - 300\bar{p} + 900 = 0$$

$$2(900) - 300\bar{p} + 900 = 0$$

$$1.800 - 300\bar{p} + 900 = 0$$

$$2.700 - 300\bar{p} = 0$$

$$-300\bar{p} = -2.700$$

$$\bar{p} = \frac{-2.700}{-300} \rightarrow \bar{p} = 9$$

$$EC = \int_0^{\bar{x}} f(x)\,dx - \bar{x}\bar{p}$$

$$EC = \int_0^{30} \left(\frac{2.500 - 20x - x^2}{100}\right) dx - 30(9)$$

$$F(x) = \int \left(\frac{2.500 - 20x - x^2}{100}\right) dx$$

$$F(x) = \int \frac{1}{100}(2.500 - 20x - x^2)\,dx$$

$$F(x) = \frac{1}{100}\int (2.500 - 20x - x^2)\,dx$$

$$F(x) = \frac{1}{100}\left(\int 2.500\,dx - \int 20x\,dx - \int x^2\,dx\right)$$

$$F(x) = \frac{1}{100}\left(2.500\int dx - 20\int x\,dx - \int x^2\,dx\right)$$

$$F(x) = \frac{1}{100}\left(2.500x - 20\frac{x^{1+1}}{1+1} - \frac{x^{2+1}}{2+1}\right) + C$$

$$F(x) = \frac{1}{100}\left(2.500x - 20\frac{x^2}{2} - \frac{x^3}{3}\right) + C$$

$$F(x) = \frac{1}{100}\left(2.500x - 10x^2 - \frac{x^3}{3}\right) + C$$

$$F(x) = 25x - \frac{x^2}{10} - \frac{x^3}{300} + C$$

$$EC = 24x - \frac{x^2}{10} - \frac{x^3}{300}\Big|_0^{30} - 270$$

$$EC = 24(30) - \frac{(30)^2}{10} - \frac{(30)^3}{300} - \left(24(0) - \frac{(0)^2}{10} - \frac{(0)^3}{300}\right) - 270$$

$$EC = 720 - \frac{900}{10} - \frac{27.000}{300} - (0) - 270$$

$$EC = 720 - 90 - 90 - 270 = 270$$

$$EP = \bar{x}\,\bar{p} - \int_0^{\bar{x}} p(x)\,dx$$

$$2x^2 - 300p + 900 = 0$$

$$-300p = -900 - 2x^2$$

$$p = \frac{-900 - 2x^2}{-300} \rightarrow p = \frac{900 + 2x^2}{300}$$

$$EP = 30(9) - \left[\int_0^{30} \left(\frac{900 + 2x^2}{300}\right) dx\right]$$

$$F(x) = \int \left(\frac{900 + 2x^2}{300}\right) dx$$

$$F(x) = \int \frac{1}{300}(900 + 2x^2)\,dx$$

$$F(x) = \frac{1}{300}\int (900 + 2x^2)\,dx$$

$$F(x) = \frac{1}{300}\left(\int 900\,dx + \int 2x^2\,dx\right)$$

$$F(x) = \frac{1}{300}\left(900\int dx + 2\int x^2\,dx\right)$$

$$F(x) = \frac{1}{300}\left(900x + 2\frac{x^{2+1}}{2+1}\right) + C \rightarrow F(x) = \frac{1}{300}\left(900x + \frac{2}{3}x^3\right) + C$$

$$F(x) = 3x + \frac{2}{900}x^3 + C$$

(184)

$$EP = 270 - \left[3x + \frac{2}{900} x^3 \Big|_0^{30} \right]$$

$$EP = 270 - \left[3(30) + \frac{2}{900}(30)^3 - \left(3(0) + \frac{2}{900}(0)^3 \right) \right]$$

$$EP = 270 - \left[90 + \frac{2(27.000)}{900} - (0) \right]$$

$$EP = 270 - \left[90 + \frac{54.000}{900} \right]$$

$$EP = 270 - (90 + 60)$$

$$EP = 270 - (150) = 270 - 150 = 120$$

(16) $10p = 3\sqrt{1.600 - 2x}$ $\qquad 10p = 2\sqrt{x + 300}$

$$\left(3\sqrt{1.600 - 2\bar{x}}\right)^2 = \left(2\sqrt{\bar{x} + 300}\right)^2$$

$$9(1.600 - 2\bar{x}) = 4(\bar{x} + 300)$$

$$14.400 - 18\bar{x} = 4\bar{x} + 1.200$$

$$-18\bar{x} - 4\bar{x} = 1.200 - 14.400$$

$$-22\bar{x} = -13.200$$

$$\bar{x} = \frac{-13.200}{-22}$$

$$\bar{x} = 600$$

$$10\bar{p} = 3\sqrt{1.600 - 2\bar{x}}$$

$$10\bar{p} = 3\sqrt{1.600 - 2(600)}$$

$$10\bar{p} = 3\sqrt{1.600 - 1.200}$$

$$10\bar{p} = 3\sqrt{400}$$

$$10\bar{p} = 3(20)$$

$$10\bar{p} = 60$$

$$\bar{p} = \frac{60}{10}^{6}$$

$$\bar{p} = 6$$

$$EC = \int_0^{\bar{x}} p(x)\,dx - \bar{x}\bar{p}$$

$$10p = 3\sqrt{1.600 - 2x}$$

$$p = \frac{3\sqrt{1.600 - 2x}}{10}$$

$$EC = \int_0^{600} \left(\frac{3\sqrt{1.600 - 2x}}{10} \right) dx - 600(6)$$

$$F(x) = \int \left(\frac{3\sqrt{1.600 - 2x}}{10} \right) dx$$

$$F(x) = \int \frac{3}{10} \sqrt{1.600 - 2x}\, dx$$

$$F(x) = \frac{3}{10} \int \sqrt{1.600 - 2x}\, dx \qquad u = 1.600 - 2x \qquad \frac{du}{dx} = -2$$

$$F(x) = \frac{3}{10} \int \sqrt{u}\, \frac{du}{-2} \qquad du = -2\,dx \qquad dx = \frac{du}{-2}$$

$$F(x) = \frac{3}{10} \int -\frac{1}{2} u^{1/2}\, du$$

$$F(x) = \frac{3}{10} \left(-\frac{1}{2} \right) \int u^{1/2}\, du$$

$$F(x) = -\frac{3}{20} \frac{u^{1/2+1}}{1/2+1} + C$$

$$F(x) = -\frac{3}{20} \frac{u^{3/2}}{3/2} + C$$

$$F(x) = -\frac{3}{20} \left(\frac{2}{3} \right) u^{3/2} + C$$

$$F(x) = -\frac{1}{10} u^{3/2} + C$$

$$F(x) = -\frac{1}{10} (1.600 - 2x)^{3/2} + C$$

$$EC = -\frac{1}{10} (1.600 - 2x)^{3/2} \Big|_0^{600} - 3.600$$

$$EC = -\frac{1}{10} [1.600 - 2(600)]^{3/2} - \left(-\frac{1}{10} [1.600 - 2(0)]^{3/2} \right) - 3.600$$

$$EC = -\frac{1}{10} [1.600 - 1.200]^{3/2} - \left(-\frac{1}{10} [1.600 - 0]^{3/2} \right) - 3.600$$

$$EC = -\frac{1}{10} (400)^{3/2} - \left(-\frac{1}{10} (1.600)^{3/2} \right) - 3.600$$

$$EC = -\frac{1}{10} \sqrt{400^3} - \left(-\frac{1}{10} \sqrt{1.600^3} \right) - 3.600$$

$$EC = -\frac{1}{10} \sqrt{(20^2)^3} + \frac{1}{10} \sqrt{(40^2)^3} - 3.600$$

$$EC = -\frac{1}{10} \sqrt{20^6} + \frac{1}{10} \sqrt{40^6} - 3.600$$

(86)

$EC = -\frac{1}{10}(20^3) + \frac{1}{10}(40^3) - 3.600$

$EC = -\frac{1}{10}(8.000) + \frac{1}{10}(64.000) - 3.600$

$EC = -800 + 6400 - 3.600 = 2.000$

$EP = \bar{x}\bar{p} - \left[\int_0^{\bar{x}} p(x)\,dx\right]$

$10p = 2\sqrt{x+300}$

$p = \frac{2\sqrt{x+300}}{10}$

$p = \frac{\sqrt{x+300}}{5}$

$EP = \bar{x}\bar{p} - \left[\int_0^{600} \frac{\sqrt{x+300}}{5}\,dx\right]$

$F(x) = \int \frac{\sqrt{x+300}}{5}\,dx$

$F(x) = \int \frac{1}{5}\sqrt{x+300}\,dx$

$F(x) = \frac{1}{5}\int \sqrt{x+300}\,dx$ $\quad u = x+300 \quad \frac{du}{dx} = 1 \quad du = dx$

$F(x) = \frac{1}{5}\int \sqrt{u}\,du$

$F(x) = \frac{1}{5}\int u^{1/2}\,du$

$F(x) = \frac{1}{5}\,\frac{u^{1/2+1}}{1/2+1} + C$

$F(x) = \frac{1}{5}\,\frac{u^{3/2}}{3/2} + C$

$F(x) = \frac{1}{5}\left(\frac{2}{3}\right)u^{3/2} + C$

$F(x) = \frac{2}{15}u^{3/2} + C$

$F(x) = \frac{2}{15}(x+300)^{3/2} + C$

$$EP = 600(6) - \left[\frac{2}{15}(x+300)^{3/2}\Big|_{0}^{600}\right]$$

$$EP = 3.600 - \left[\frac{2}{15}(600+300)^{3/2} - \left(\frac{2}{15}(0+300)^{3/2}\right)\right]$$

$$EP = 3.600 - \left[\frac{2}{15}(900)^{3/2} - \left(\frac{2}{15}(300)^{3/2}\right)\right]$$

$$EP = 3.600 - \left[\frac{2}{15}\sqrt{900^3} - \left(\frac{2}{15}\sqrt{300^3}\right)\right]$$

$$EP = 3.600 - \left[\frac{2}{15}\sqrt{(30^2)^3} - \left(\frac{2}{15}\sqrt{(3\cdot 10^2)^3}\right)\right]$$

$$EP = 3.600 - \left[\frac{2}{15}\sqrt{30^6} - \left(\frac{2}{15}\sqrt{3^3\,10^6}\right)\right]$$

$$EP = 3.600 - \left[\frac{2}{15}(30^3) - \left(\frac{2}{15}(3^2)(10^3)\sqrt{3}\right)\right]$$

$$EP = 3.600 - \left[\frac{2}{15}(27.000) - \left(\frac{2}{15}(9)(1.000)\sqrt{3}\right)\right]$$

$$EP = 3.600 - \left[\frac{54.000}{15} - \left(\frac{2}{15}(9.000)\sqrt{3}\right)\right]$$

$$EP = 3.600 - \left[3.600 - \left(\frac{18.000\sqrt{3}}{15}\right)\right]$$

$$EP = 3.600 - [3.600 - (1.200\sqrt{3})]$$

$$EP = 3.600 - [3.600 - 1.200\sqrt{3})]$$

$$EP = 3.600 - 3.600 + 1.200\sqrt{3} = 1.200\sqrt{3} = 2.078,46$$

(17) $30p = 3.600 - x^2$ $\qquad C(x) = (x+20)^2$

$R(x) = px$ $\qquad 30p = 3.600 - x^2$

$R(x) = \left(\frac{3.600 - x^2}{30}\right)x$ $\qquad p = \frac{3.600 - x^2}{30}$

$$R(x) = \frac{3.600x - x^3}{30}$$

188)

$$R'(x) = \left(\frac{3.600x - x^3}{30}\right)'$$

$$R'(x) = \left[\frac{1}{30}(3.600x - x^3)\right]'$$

$$R'(x) = \frac{1}{30}(3.600x - x^3)'$$

$$R'(x) = \frac{1}{30}[(3.600x)' - (x^3)']$$

$$R'(x) = \frac{1}{30}(3.600 - 3x^{3-1})$$

$$R'(x) = \frac{1}{30}(3.600 - 3x^2)$$

$$R'(x) = 120 - \frac{x^2}{10}$$

$$C'(x) = [(x+20)^2]'$$

$$C'(x) = 2(x+20)^{2-1}(x+20)'$$

$$C'(x) = 2(x+20)[(x)' + (20)']$$

$$C'(x) = 2(x+20)[1+0]$$

$$C'(x) = 2(x+20)(1)$$

$$C'(x) = 2x + 40$$

$$120 - \frac{\bar{x}^2}{10} = 2\bar{x} + 40$$

$$\frac{1.200 - \bar{x}^2}{10} = 20\bar{x} + 400$$

$$1.200 - \bar{x}^2 = 20\bar{x} + 400$$

$$-\bar{x}^2 - 20\bar{x} + 1.200 - 400 = 0$$

$$-\bar{x}^2 - 20\bar{x} + 800 = 0 \quad (-1)$$

$$\bar{x}^2 + 20\bar{x} - 800 = 0$$

$$\Delta = B^2 - 4AC$$

$$\Delta = (20)^2 - 4(1)(-800)$$

$$\Delta = 400 + 3.200$$

$$\Delta = 3.600$$

$$\bar{x} = \frac{-b \pm \sqrt{\Delta}}{2A}$$

$$\bar{x} = \frac{-20 \pm 60}{2(1)}$$

$$\bar{x} = \frac{-20 \pm 60}{2} \rightarrow 20 \text{ ou } -40$$

$$p' = \left(\frac{3.600 - x^2}{30}\right)'$$

$$p' = \left[\frac{1}{30}(3.600 - x^2)\right]'$$

$$p' = \frac{1}{30}(3.600 - x^2)'$$

$$p' = \frac{1}{30}[(3.600)' - (x^2)']$$

$$p' = \frac{1}{10}[0 - 2x^{2-1}]$$

$$p' = \frac{1}{10}(-2x)$$

$$p' = -\frac{2}{10}x$$

$$p' = -\frac{1}{5}x$$

$30\bar{p} = 3.600 - \bar{x}^2$

$30\bar{p} = 3.600 - (20)^2$

$30\bar{p} = 3.600 - 400$

$30\bar{p} = 3.200$

$\rightarrow \bar{p} = \frac{3.200}{30} \quad (320)$

$\bar{p} = \frac{320}{3}$

$EC = \int_0^{\bar{x}} f(x)\,dx - \bar{x}\bar{p}$

$EC = \int_0^{20} \left(\frac{3.600 - x^2}{30}\right) dx - 20\left(\frac{320}{3}\right)$

$F(x) = \int \left(\frac{3.600 - x^2}{30}\right) dx$

$F(x) = \int \frac{1}{30}(3.600 - x^2)\,dx$

$F(x) = \frac{1}{30}\int (3.600 - x^2)\,dx$

$F(x) = \frac{1}{30}\left(\int 3.600\,dx - \int x^2\,dx\right)$

$F(x) = \frac{1}{30}\left(3.600\int dx - \int x^2\,dx\right)$

$F(x) = \frac{1}{30}\left(3.600x - \frac{x^{2+1}}{2+1}\right) + C$

$F(x) = \frac{1}{30}\left(3.600x - \frac{x^3}{3}\right) + C$

$F(x) = 120x - \frac{x^3}{90} + C$

$EC = 120x - \frac{x^3}{90}\Big|_0^{20} - \frac{6.400}{3}$

$EC = 120(20) - \frac{(20)^3}{90} - \left(120(0) - \frac{(0)^3}{90}\right) - \frac{6.400}{3}$

$EC = 2.400 - \frac{8.000}{90} - 0 - \frac{6.400}{3}$

$EC = 2.400 - \frac{800}{9} - \frac{6.400}{3}$

$EC = \frac{21.600 - 800 - 19.200}{9} = \frac{1600}{9} = 177,78$

1901

18) $10p = 1.600 - x^2$ $\quad C(x) = \frac{1}{2}x^2 + 60x$

$R(x) = px$

$R(x) = \left(\frac{1.600 - x^2}{10}\right)x$

$R(x) = \frac{1.600x - x^3}{10}$

$10p = 1.600 - x^2$

$p = \frac{1.600 - x^2}{10}$

$R'(x) = \left(\frac{1.600x - x^3}{10}\right)'$

$R'(x) = \left[\frac{1}{10}(1600x - x^3)\right]'$

$R'(x) = \frac{1}{10}(1.600x - x^3)'$

$R'(x) = \frac{1}{10}[(1.600x)' - (x^3)']$

$R'(x) = \frac{1}{10}(1600 - 3x^{3-1})$

$R'(x) = \frac{1}{10}(1.600 - 3x^2)$

$R'(x) = 160 - \frac{3}{10}x^2$

$C'(x) = \left(\frac{1}{2}x^2 + 60x\right)'$

$C'(x) = \left(\frac{1}{2}x^2\right)' + (60x)'$

$C'(x) = \frac{1}{2}(x^2)' + 60$

$C'(x) = \frac{1}{2}(2x^{2-1}) + 60$

$C'(x) = \frac{1}{2}(2x) + 60$

$C'(x) = \frac{1}{2}1(2x) + 60$

$C'(x) = x + 60$

$C'(x) = R'(x)$

$\bar{x} + 60 = 160 - \frac{3}{10}\bar{x}^2$

$\frac{10\bar{x} + 600}{10} = \frac{1.600 - 3\bar{x}^2}{10}$

$10\bar{x} + 600 = 1.600 - 3\bar{x}^2$

$3\bar{x}^2 + 10\bar{x} + 600 - 1600 = 0$

$3\bar{x}^2 + 10\bar{x} - 1.000 = 0$

$\Delta = B^2 - 4AC$

$\Delta = (10)^2 - 4(3)(-7.000)$

$\Delta = 100 + 12.000$

$\Delta = 12.100$

$\bar{x} = \frac{-b \pm \sqrt{\Delta}}{2A}$

$\bar{x} = \frac{-10 \pm 110}{2(3)}$

$\bar{x} = \frac{-10 \pm 110}{6}$

$\frac{100}{6_3} = \frac{50}{3}$

$-\frac{120}{6} = -20$

$p' = \left(\frac{7.600 - x^2}{10}\right)'$

$p' = \left[\frac{1}{10}(7.600 - x^2)\right]'$

$p' = \frac{1}{10}(7.600 - x^2)'$

$p' = \frac{1}{10}[(7.600)' - (x^2)']$

$p' = \frac{1}{10}(0 - 2x^{2-1})$

$p' = \frac{1}{10}(-2x)$

$p' = -\frac{2}{10_5}x$

$p' = -\frac{1}{5}x$

$\bar{p} = \frac{7.600 - \bar{x}^2}{10}$

$\bar{p} = \frac{7.600 - \left(\frac{50}{3}\right)^2}{10}$

$\bar{p} = \frac{7.600 - \frac{2.500}{3}}{10}$

$\bar{p} = \frac{\frac{7.800 - 2.500}{3}}{10}$

$\bar{p} = \frac{\frac{2.300}{3}}{10}$

$\bar{p} = \frac{2.300}{3} \cdot \frac{1}{10_1}$

$\bar{p} = \frac{230}{3}$

$EC = \int_0^{\bar{x}} p(x)\,dx - \bar{x}\,\bar{p}$

$EC = \int_0^{\frac{50}{3}} \left(\frac{7.600 - x^2}{10}\right) dx - \frac{50}{3}\left(\frac{230}{3}\right)$

$F(x) = \int \left(\frac{7.600 - x^2}{10}\right) dx$

$F(x) = \int \frac{1}{10}(7.600 - x^2)\,dx$

$F(x) = \frac{1}{10}\int (7.600 - x^2)\,dx$

$F(x) = \frac{1}{10}\left(\int 7.600\,dx - \int x^2\,dx\right)$

$F(x) = \frac{1}{10}\left(7.600\int dx - \int x^2\,dx\right)$

$F(x) = \frac{1}{10}\left(7.600x - \frac{x^{2+1}}{2+1}\right) + C$

192

$$F(x) = \frac{1}{10}\left(1.600x - \frac{x^3}{3}\right) + C$$

$$F(x) = 160x - \frac{x^3}{30} + C$$

$$EC = 160x - \frac{x^3}{30}\Big|_0^{\frac{30}{3}} - \frac{11.500}{9}$$

$$EC = 160\left(\frac{30}{3}\right) - \frac{\left(\frac{30}{3}\right)^3}{30} - \left(160(0) + \frac{(0)^3}{30}\right) - \frac{11.500}{9}$$

$$EC = \frac{8.000}{3} - \frac{\left(\frac{125.000}{27}\right)}{30} - (0) - \frac{11.500}{9}$$

$$EC = \frac{8.000}{3} - \frac{125.000}{27} \cdot \frac{1}{30_3} - \frac{11.500}{9}$$

$$EC = \frac{8.000}{3} - \frac{12.500}{81} - \frac{11.500}{9}$$

$$EC = \frac{216.000 - 12.500 - 103.500}{81} = \frac{100.000}{81} = 1.235,57$$