CHAPTER 6 REVIEW EXERCISES, page 490

1. $\int (x^3 + 2x^2 - x)\,dx = \frac{1}{4}x^4 + \frac{2}{3}x^3 - \frac{1}{2}x^2 + C.$

2. $\int (\frac{1}{3}x^3 - 2x^2 + 8)\,dx = \frac{1}{12}x^4 - \frac{2}{3}x^3 + 8x + C$

3. $\int \left(x^4 - 2x^3 + \frac{1}{x^2}\right) dx = \frac{x^5}{5} - \frac{1}{2}x^4 - \frac{1}{x} + C$

4. $\int (x^{1/3} - x^{1/2} + 4)\,dx = \frac{3}{4}x^{4/3} - \frac{2}{3}x^{3/2} + 4x + C$

5. $\int x(2x^2 + x^{1/2})dx = \int (2x^3 + x^{3/2})\,dx = \frac{1}{2}x^4 + \frac{2}{5}x^{5/2} + C.$

6. $\int (x^2 + 1)(\sqrt{x} - 1)\,dx = \int (x^{5/2} - x^2 + x^{1/2} - 1)\,dx = \frac{2}{7}x^{7/2} - \frac{1}{3}x^3 + \frac{2}{3}x^{3/2} - x + C.$

7. $\int (x^2 - x + \frac{2}{x} + 5)\,dx = \int x^2\,dx - \int x\,dx + 2\int \frac{dx}{x} + 5\int dx$

$$= \frac{1}{3}x^3 - \frac{1}{2}x^2 + 2\ln|x| + 5x + C.$$

8. Let $u = 2x + 1$ so that $du = 2\,dx$ or $dx = \frac{1}{2}\,du$. So

$$\int \sqrt{2x+1}\,dx = \frac{1}{2}\int u^{1/2}\,du = \frac{1}{3}u^{3/2} = \frac{1}{3}(2x+1)^{3/2} + C.$$

9. Let $u = 3x^2 - 2x + 1$ so that $du = (6x - 2)\,dx = 2(3x - 1)\,dx$ or $(3x - 1)\,dx = \frac{1}{2}\,du$.

So $\int (3x-1)(3x^2 - 2x + 1)^{1/3}\,dx = \frac{1}{2}\int u^{1/3}\,du = \frac{3}{8}u^{4/3} + C = \frac{3}{8}(3x^2 - 2x + 1)^{4/3} + C.$

10. Put $u = x^3 + 2$ so that $du = 3x^2\,dx$ or $x^2\,dx = \frac{1}{3}\,du$. Then

$$\int x^2(x^3 + 2)^{10}\,dx = \frac{1}{3}\int u^{10}\,du = \frac{1}{33}u^{11} + C = \frac{(x^3+2)^{11}}{33} + C.$$

11. Let $u = x^2 - 2x + 5$ so that $du = 2(x - 1)\,dx$ or $(x - 1)\,dx = \frac{1}{2}\,du$.

$$\int \frac{x-1}{x^2-2x+5}\,dx = \frac{1}{2}\int \frac{du}{u} = \frac{1}{2}\ln|u| + C = \frac{1}{2}\ln(x^2-2x+5) + C.$$

12. Let $u = -2x$ so that $du = -2\,dx$. Then

$$\int 2e^{-2x}\,dx = -\int e^u\,du = -e^u + C = -e^{-2x} + C.$$

13. Put $u = x^2 + x + 1$ so that $du = (2x + 1)\,dx = 2(x + \frac{1}{2})\,dx$ and $(x+\frac{1}{2})dx = \frac{1}{2}du$.

$$\int (x+\tfrac{1}{2})e^{x^2+x+1}dx = \tfrac{1}{2}\int e^u\,du = \tfrac{1}{2}e^u + C = \tfrac{1}{2}e^{x^2+x+1} + C.$$

14. Let $u = e^{-x} + x$ so that $du = (-e^{-x} + 1)\,dx$ or $(e^{-x} - 1)\,dx = -du$. So

$$\int \frac{e^{-x}-1}{(e^{-x}+x)^2}\,dx = -\int \frac{du}{u^2} = \frac{1}{u} + C = \frac{1}{e^{-x}+x} + C.$$

15. Let $u = \ln x$ so that $du = \frac{1}{x}\,dx$. Then

$$\int \frac{(\ln x)^5}{x}\,dx = \int u^5\,du = \frac{1}{6}u^6 + C = \frac{1}{6}(\ln x)^6 + C.$$

16. $\displaystyle\int \frac{\ln x^2}{x}\,dx = 2\int \frac{\ln x}{x}\,dx.$ Now, put $u = \ln x$ so that $du = \frac{1}{x}\,dx$.

Then $\displaystyle\int \frac{\ln x^2}{x}\,dx = 2\int u\,du = u^2 + C = (\ln x)^2 + C.$

17. Let $u = x^2 + 1$ so that $du = 2x\,dx$ or $x\,dx = \frac{1}{2}\,du$. Then

$$\int x^3(x^2+1)^{10}\,dx = \tfrac{1}{2}\int (u-1)u^{10}\,du \qquad (x^2 = u - 1)$$

$$= \tfrac{1}{2}\int (u^{11} - u^{10})\,du = \tfrac{1}{2}(\tfrac{1}{12}u^{12} - \tfrac{1}{11}u^{11}) + C$$

$$= \tfrac{1}{264}u^{11}(11u-12) + C = \tfrac{1}{264}(x^2+1)^{11}(11x^2-1) + C.$$

18. Let $u = x + 1$ so that $du = dx$. Then $x = u - 1$. So

$$\int x\sqrt{x+1}\,dx = \int (u-1)u^{1/2}\,du = \int (u^{3/2} - u^{1/2})\,du$$

$$= \tfrac{2}{5}u^{5/2} - \tfrac{2}{3}u^{3/2} + C = \tfrac{2}{15}u^{3/2}(3u-5) + C$$

$$= \tfrac{2}{15}(3x-2)(x+1)^{3/2} + C.$$

19. Put $u = x - 2$ so that $du = dx$. Then $x = u + 2$ and

$$\int \frac{x}{\sqrt{x-2}}\,dx = \int \frac{u+2}{\sqrt{u}}\,du = \int (u^{1/2} + 2u^{-1/2})\,du = \int u^{1/2}\,du + 2\int u^{-1/2}\,du$$

$$= \tfrac{2}{3}u^{3/2} + 4u^{1/2} + C = \tfrac{2}{3}u^{1/2}(u+6) + C = \tfrac{2}{3}\sqrt{x-2}(x-2+6) + C$$

$$= \tfrac{2}{3}(x+4)\sqrt{x-2} + C.$$

20. Let $u = x + 1$ so that $du = dx$. Furthermore, $x = u - 1$, so

$$\int \frac{3x}{\sqrt{x+1}}\,dx = 3\int \frac{u-1}{\sqrt{u}}\,du = 3\int (u^{1/2} - u^{-1/2})\,du = 3(\tfrac{2}{3}u^{3/2} - 2u^{1/2}) + C$$

$$= 2u^{1/2}(u-3) + C = 2(x-2)\sqrt{x+1} + C.$$

21. $\int_0^1 (2x^3 - 3x^2 + 1)\,dx = \tfrac{1}{2}x^4 - x^3 + x\Big|_0^1 = \tfrac{1}{2} - 1 + 1 = \tfrac{1}{2}.$

22. $\int_0^2 (4x^3 - 9x^2 + 2x - 1)\,dx = x^4 - 3x^3 + x^2 - x\Big|_0^2 = 16 - 24 + 4 - 2 = -6.$

23. $\int_1^4 (x^{1/2} + x^{-3/2})\,dx = \tfrac{2}{3}x^{3/2} - 2x^{-1/2}\Big|_1^4 = \tfrac{2}{3}x^{3/2} - \dfrac{2}{\sqrt{x}}\Big|_1^4 = (\tfrac{16}{3} - 1) - (\tfrac{2}{3} - 2) = \tfrac{17}{3}.$

24. Let $u = 2x^2 + 1$ so that $du = 4x\,dx$ or $x\,dx = \tfrac{1}{4}\,du$. Also, if $x = 0$, then $u = 1$ and if $x = 1$, then $u = 3$. So

$$\int_0^1 20x(2x^2+1)^4\,dx = \frac{20}{4}\int_1^3 u^4\,du = u^5\Big|_1^3 = 243 - 1 = 242.$$

25. Put $u = x^3 - 3x^2 + 1$ so that $du = (3x^2 - 6x)\,dx = 3(x^2 - 2x)\,dx$ or $(x^2 - 2x)\,dx = \tfrac{1}{3}du$. Then if $x = -1$, $u = -3$, and if $x = 0$, $u = 1$,

$$\int_{-1}^{0} 12(x^2-2x)(x^3-3x^2+1)^3\,dx = (12)(\tfrac{1}{3})\int_{-3}^{1} u^3\,du = 4(\tfrac{1}{4})u^4\Big|_{-3}^{1}$$
$$= 1 - 81 = -80.$$

26. Let $u = x - 3$ so that $du = dx$. If $x = 4$, then $u = 1$ and if $x = 7$, then $u = 4$. So
$$\int_4^7 x\sqrt{x-3}\,dx = \int_1^4 (u+3)\sqrt{u}\,du = \int_1^4 (u^{3/2}+3u^{1/2})du$$
$$= \tfrac{2}{5}u^{5/2} + 2u^{3/2}\Big|_1^4 = (\tfrac{64}{5}+16) - (\tfrac{2}{5}+2) = \tfrac{132}{5}.$$

27. Let $u = x^2 + 1$ so that $du = 2x\,dx$ or $x\,dx = \frac{1}{2}\,du$. Then, if $x = 0$, $u = 1$, and if $x = 2$, $u = 5$, so
$$\int_0^2 \frac{x}{x^2+1}dx = \frac{1}{2}\int_1^5 \frac{du}{u} = \frac{1}{2}\ln u\Big|_1^5 = \frac{1}{2}\ln 5.$$

28. Let $u = 5 - 2x$ so that $du = -2\,dx$, or $dx = -\frac{1}{2}\,du$. If $x = 0$, then $u = 5$ and if $x = 1$, then $u = 3$. Therefore,
$$\int_0^1 (5-2x)^{-2}\,dx = \int_5^3 -\frac{1}{2}\cdot\frac{du}{u^2} = \frac{1}{2}u^{-1}\Big|_5^3 = \frac{1}{6} - \frac{1}{10} = \frac{1}{15}.$$

29. Let $u = 1 + 2x^2$ so that $du = 4x\,dx$ or $x\,dx = \frac{1}{4}\,du$. If $x = 0$, then $u = 1$ and if $x = 2$, then $u = 9$.
$$\int_0^2 \frac{4x}{\sqrt{1+2x^2}}dx = \int_1^9 \frac{du}{u^{1/2}} = 2u^{1/2}\Big|_1^9 = 2(3-1) = 4.$$

30. Let $u = -\frac{1}{2}x^2$ so that $du = -x\,dx$ or $x\,dx = -\,du$. If $x = 0$, then $u = 0$ and if $x = 2$, then $u = -2$. So
$$\int_0^2 xe^{(-1/2)x^2}\,dx = -\int_0^{-2} e^u\,du = -e^u\Big|_0^{-2} = -e^{-2}+1 = 1 - \frac{1}{e^2}.$$

31. Let $u = 1 + e^{-x}$ so that $du = -e^{-x}\,dx$ and $e^{-x}\,dx = -\,du$. Then
$$\int_{-1}^{0} \frac{e^{-x}}{(1+e^{-x})^2}dx = -\int_{1+e}^{2} \frac{du}{u^2} = \frac{1}{u}\Bigg|_{1+e}^{2} = \frac{1}{2} - \frac{1}{1+e} = \frac{e-1}{2(1+e)}.$$

32. Let $u = \ln x$ so that $du = \frac{1}{x}\,dx$. If $x = 1$, then $u = 0$, and if $x = e$, then $u = \ln e = 1$. So

$$\int_1^e \frac{\ln x}{x}\,dx = \int_0^1 u\,du = \frac{1}{2}u^2\Big|_0^1 = \frac{1}{2}.$$

33. $f(x) = \int f'(x)\,dx = \int (3x^2 - 4x + 1)\,dx = 3\int x^2\,dx - 4\int x\,dx + \int dx$

$= x^3 - 2x^2 + x + C.$

The given condition implies that $f(1) = 1$ or $1 - 2 + 1 + C = 1$, and $C = 1$. Therefore, the required function is $f(x) = x^3 - 2x^2 + x + 1$.

34. $f(x) = \int f'(x)\,dx = \int \frac{x}{\sqrt{x^2+1}}\,dx$. Let $u = x^2 + 1$ so that

$du = 2x\,dx$ or $x\,dx = \frac{1}{2}du$. So $f(x) = \frac{1}{2}\int \frac{du}{\sqrt{u}} = \sqrt{u} + C = \sqrt{x^2+1} + C.$

Now $f(0) = 1$ implies $\sqrt{0+1} + C = 1$ or $C = 0$. So $f(x) = \sqrt{x^2+1}$.

35. $f(x) = \int f'(x)\,dx = \int (1 - e^{-x})\,dx = x + e^{-x} + C$, $f(0) = 2$ implies $0 + 1 + C = 2$ or $C = 1$. So $f(x) = x + e^{-x} + 1$.

36. $f(x) = \int f'(x)\,dx = \int \frac{\ln x}{x}\,dx$. Let $u = \ln x$ so that $du = \frac{1}{x}\,dx$. Then

$f(x) = \int u\,du = \frac{1}{2}u^2 + C = \frac{1}{2}(\ln x)^2 + C$. $f(1) = 0 + C = -2$ gives $C = -2$. So the required function is $f(x) = \frac{1}{2}(\ln x)^2 - 2$.

37. $\Delta x = \frac{2-1}{5} = \frac{1}{5}$; $x_1 = \frac{6}{5}$, $x_2 = \frac{7}{5}$, $x_3 = \frac{8}{5}$, $x_4 = \frac{9}{5}$, $x_5 = \frac{10}{5}$. The Riemann sum is

$$f(x_1)\Delta x + \cdots + f(x_5)\Delta x = \left\{\left[-2(\tfrac{6}{5})^2 + 1\right] + \left[-2(\tfrac{7}{5})^2 + 1\right] + \cdots + \left[-2(\tfrac{10}{5})^2 + 1\right]\right\}(\tfrac{1}{5})$$

$$= \tfrac{1}{5}(-1.88 - 2.92 - 4.12 - 5.48 - 7) = -4.28.$$

38. $C(x) = \int C'(x)\,dx = \int (0.00003x^2 - 0.03x + 20)\,dx$

$= 0.00001x^3 - 0.015x^2 + 20x + k.$

$C(0) = k = 500$. So the required total cost function is

$$C(x) = 0.00001x^3 - 0.015x^2 + 20x + 500.$$

The total cost in producing the first 400 coffeemakers per day is

$$C(400) = 0.00001(400)^3 - 0.015(400)^2 + 20(400) + 500 = 6740, \text{ or } \$6740.$$

39. a. $R(x) = \int R'(x)\,dx = \int (-0.03x + 60)\,dx = -0.015x^2 + 60x + C$.

$R(0) = 0$ implies that $C = 0$. So, $R(x) = -0.015x^2 + 60x$.

b. From $R(x) = px$, we have $-0.015x^2 + 60x = px$ or $p = -0.015x + 60$.

40. $V(t) = \int V'(t)\,dt = 3800\int (t-10)\,dt = 1900(t-10)^2 + C$. The initial condition implies that $V(0) = 200{,}000$, that is, $190{,}000 + C = 200{,}000$ or $C = 10{,}000$. Therefore, $V(t) = 1900(t-10)^2 + 10{,}000$. The resale value of the computer after 6 years is given by

$$V(6) = 1900(-4)^2 + 10{,}000 = 40{,}400, \text{ or } \$40{,}400.$$

41. The total number of systems that Vista may expect to sell t months from the time they are put on the market is given by $f(t) = 3000t - 50{,}000(1 - e^{-0.04t})$.

The number is $\int_0^{12} (3000 - 2000e^{-0.04t})\,dt = \left(3000t - \dfrac{2000}{-0.04}e^{-0.04t}\right)\Bigg|_0^{12}$

$$= 3000(12) + 50{,}000e^{-0.48} - 50{,}000 = 16{,}939.$$

42. The number will be

$$N(t) = \int 3000(1 + 0.4t)^{-1/2}\,dt = \frac{3000}{0.4}\cdot 2(1 + 0.4t)^{1/2} + C \qquad \text{(Let } u = 1 + 0.4t\text{.)}$$

$$= 15{,}000\sqrt{1 + 0.4t} + C.$$

$N(0) = 100{,}000$ implies $15{,}000 + C = 100{,}000$, or $C = 85{,}000$. Therefore, $N(t) = 15{,}000\sqrt{1 + 0.4t} + 85{,}000$. The number using the subway six months from now will be $N(6) = 15{,}000\sqrt{1 + 2.4} + 85{,}000 \approx 112{,}659$.

43. $C(x) = \int C'(x)\,dx = \int (0.00003x^2 - 0.03x + 10)\,dx$

$$= 0.00001x^3 - 0.015x^2 + 10x + k.$$

But $C(0) = 600$ and this implies that $k = 600$. Therefore,

$$C(x) = 0.00001x^3 - 0.015x^2 + 10x + 600.$$

The total cost incurred in producing the first 500 corn poppers is

$$C(500) = 0.00001(500)^3 - 0.015(500)^2 + 10(500) + 600$$

$= 3{,}100$, or \$3,100.

44. The amount of coal produced was

$$\int_0^5 3.5e^{0.04t}\,dt = \frac{3.5}{0.04}e^{0.04t}\Big|_0^5 = 87.5(e^{0.2}-1) \approx 19.4,$$

or approximately 19.4 billion metric tons.

45. $A = \int_{-1}^{2}(3x^2+2x+1)\,dx = x^3+x^2+x\big|_{-1}^{2} = [2^3+2^2+2]-[(-1)^3+1-1]$
$= 14-(-1) = 15.$

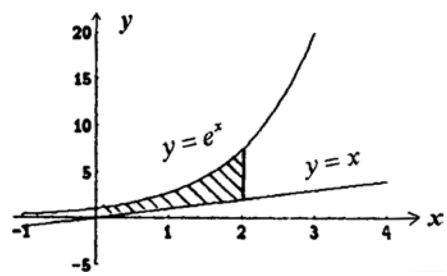
46. $A = \int_0^2 e^{2x}\,dx = \frac{1}{2}e^{2x}\Big|_0^2 = \frac{1}{2}(e^4-1)$ sq units.

47. $A = \int_1^3 \frac{1}{x^2}\,dx = \int_1^3 x^{-2}\,dx = -\frac{1}{x}\Big|_1^3 = -\frac{1}{3}+1 = \frac{2}{3}.$

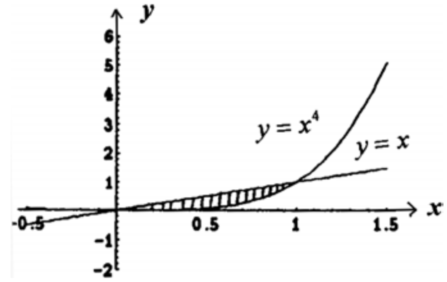
48. $A = \int_{-2}^{1}(-x^2-x+2)\,dx = -\frac{x^3}{3}-\frac{x^2}{2}+2x\Big|_{-2}^{1} = \left(-\frac{1}{3}-\frac{1}{2}+2\right)-\left(\frac{8}{3}-\frac{4}{2}-4\right)$
$= \frac{7}{6}+\frac{10}{3} = 4\frac{1}{2}.$

49.

$$A = \int_a^b[f(x)-g(x)]\,dx$$
$$= \int_0^2(e^x-x)\,dx$$
$$= \left(e^x-\frac{1}{2}x^2\right)\Big|_0^2$$
$$= (e^2-2)-(1-0) = e^2-3.$$

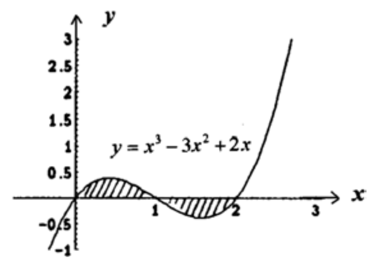


50. To find the points of intersection of the two curves, we solve $x^4 = x$, $x(x^3 - 1) = 0$ giving $x = 0$ or 1. The region is shown in the figure at the right.



$$A = \int_0^1 (x - x^4)\,dx = \tfrac{1}{2}x^2 - \tfrac{1}{5}x^5\Big|_0^1 = \tfrac{1}{2} - \tfrac{1}{5}$$
$$= \tfrac{3}{10} \text{ sq units.}$$

51. $$A = \int_0^1 (x^3 - 3x^2 + 2x)\,dx - \int_1^2 (x^3 - 3x^2 + 2x)\,dx$$
$$= \tfrac{x^4}{4} - x^3 + x^2\Big|_0^1 - \left(\tfrac{x^4}{4} - x^3 + x^2\right)\Big|_1^2$$
$$= \tfrac{1}{4} - 1 + 1 - [(4 - 8 + 4) - (\tfrac{1}{4} - 1 + 1)]$$
$$= \tfrac{1}{4} + \tfrac{1}{4} = \tfrac{1}{2}.$$



52. The additional oil that will be produced over the next ten years is given by
$$\int_0^{10} [R_2(t) - R_1(t)]\,dt = \int_0^{10} (100e^{0.08t} - 100e^{0.05t})\,dt = 100\int_0^{10} (e^{0.08t} - e^{0.05t})\,dt$$
$$= \frac{100}{0.08}e^{0.08t} - \frac{100}{0.05}e^{0.05t}\Big|_0^{10} = 1250e^{0.8} - 2000e^{0.5} - 1250 + 2000$$
$$= 2781.9 - 3297.4 - 1250 + 2000 = 234.5$$
or 234,500 barrels. (t is expressed in thousands of barrels.)

53. $$A = \frac{1}{3}\int_0^3 \frac{x}{\sqrt{x^2+16}}\,dx = \frac{1}{3}\cdot\frac{1}{2}\cdot 2(x^2+16)^{1/2}\Big|_0^3$$
$$= \frac{1}{3}(x^2+16)^{1/2}\Big|_0^3 = \frac{1}{3}(5-4) = \frac{1}{3} \quad \text{sq units.}$$

54. Setting $p = 8$, we have $-0.01x^2 - 0.2x + 23 = 8$, $-0.01x^2 - 0.2x + 15 = 0$, or $x^2 + 20x - 1500 = (x - 30)(x + 50) = 0$, giving $x = -50$ or 30.
$$CS = \int_0^{30} (-0.01x^2 - 0.2x + 23)\,dx - 8(30) = -\frac{0.01}{3}x^3 - 0.1x^2 + 23x\Big|_0^{30} - 240$$
$$= -\frac{0.01(30)^3}{3} - 0.1(900) + 23(30) - 240 = 270, \quad \text{or } \$270{,}000.$$

55. To find the equilibrium point, we solve $0.1x^2 + 2x + 20 = -0.1x^2 - x + 40$
$0.2x^2 + 3x - 20 = 0$, $x^2 + 15x - 100 = 0$, $(x + 20)(x - 5) = 0$, or $x = 5$.
Therefore, $p = -0.1(25) - 5 + 40 = 32.5$.

$$CS = \int_0^5 (-0.1x^2 - x + 40)\,dx - (5)(32.5) = -\frac{0.1}{3}x^3 - \frac{1}{2}x^2 + 40x\Big|_0^5 - 162.5$$
$= 20.833$, or \$2083.

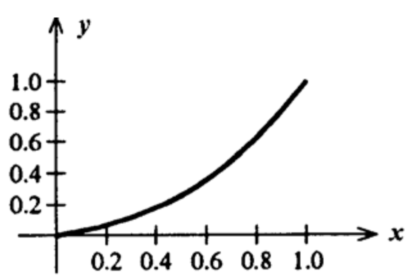
$$PS = (5)(32.5) - \int_0^5 (0.1x^2 + 2x + 20)\,dx = 162.5 - \tfrac{0.1}{3}x^3 + x^2 + 20x)\Big|_0^5$$
$= 33.333$, or \$3,333.

56. Use Equation (17) with $P = 4000$, $r = 0.08$, $T = 20$, and $m = 1$, obtaining
$$A = \frac{(1)(4000)}{0.08}(e^{1.6} - 1) \approx 197{,}651.62$$
that is, Chi-Tai will have approximately \$197,652 in his account after 20 years.

57. Use Equation (18) with $P = 925$, $m = 12$, $T = 30$, and $r = 0.12$, obtaining
$$PV = \frac{mP}{r}(1 - e^{-rT}) = \frac{(12)(925)}{(0.12)}(1 - e^{-0.12(30)}) = 89972.56,$$
and we conclude that the present value of the purchase price of the house is \$89,972.56 + \$9000 , or \$98,972.56.

58. Here $P = 80{,}000$, $m = 1$, $T = 10$, and $r = 0.1$, so
$$PV = \frac{(1)(80{,}000)}{0.1}(1 - e^{-1}) \approx 505{,}696, \text{ or approximately } \$505{,}696.$$

59. a.



b. $f(0.3) = \frac{17}{18}(0.3)^2 + \frac{1}{18}(0.3) \approx 0.1$ so that 30 percent of the people receive 10 percent of the total income. $f(0.6) = \frac{17}{18}(0.6)^2 + \frac{1}{18}(0.6) \approx 0.37$ so that 60 percent of the people receive 37 percent of the total revenue.

c. The coefficient of inequality for this curve is

$$L = 2\int_0^1 [x - \tfrac{17}{18}x^2 - \tfrac{1}{18}x]\,dx = \tfrac{17}{9}\int_0^1 (x - x^2)\,dx = \tfrac{17}{9}\left(\tfrac{1}{2}x^2 - \tfrac{1}{3}x^3\right)\Big|_0^1$$

$$= \tfrac{17}{54} \approx 0.315.$$

60. The average population will be

$$\tfrac{1}{5}\int 80{,}000e^{-0.05t}\,dt = \frac{80{,}000}{5}\cdot\left(-\frac{1}{0.05}\right)e^{-0.05t}\Big|_0^5 = -320{,}000(e^{-0.25} - 1) \approx 70{,}784.$$

61. $V = \pi\int_1^3 \frac{dx}{x^2} = -\frac{\pi}{x}\Big|_1^3 = \pi(-\frac{1}{3} + 1) = \frac{2\pi}{3}$ cu units.

62. Solving the equation $x^{1/2} = x^2$, we find that $x^{1/2}(x^{3/2} - 1) = 0$ and $x = 0$ or $x = 1$. Next,

$$V = \pi\int_0^1 (x - x^4)dx = \pi(\tfrac{1}{2}x^2 - \tfrac{1}{5}x^5)\Big|_0^1 = \pi(\tfrac{1}{2} - \tfrac{1}{5}) = \tfrac{3\pi}{10} \text{ cu units.}$$