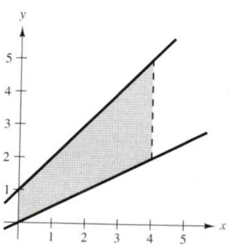
Chapter 7

Section 7.1 (page 454)

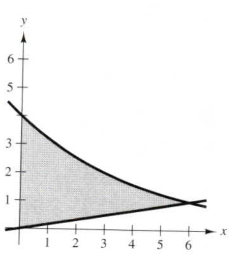
1. $-\int_0^6 (x^2 - 6x)\,dx$ **3.** $\int_0^3 (-2x^2 + 6x)\,dx$

5. $-6\int_0^1 (x^3 - x)\,dx$

7.



9.



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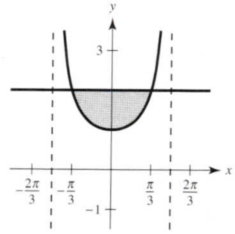
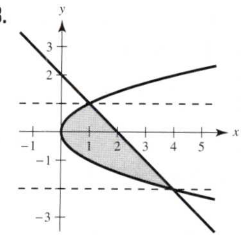


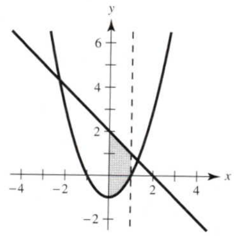
13.



15. d

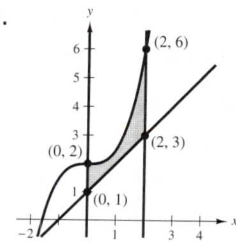
17. (a) $\frac{125}{6}$ (b) $\frac{125}{6}$ (c) Integrating with respect to y; Answers will vary.

19.



$\frac{13}{6}$

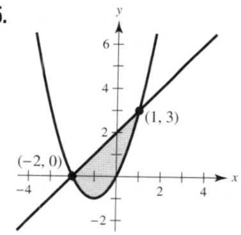
21.



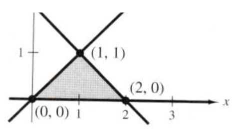
2

e

25.

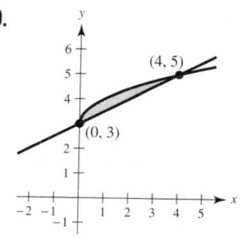


$\frac{9}{2}$



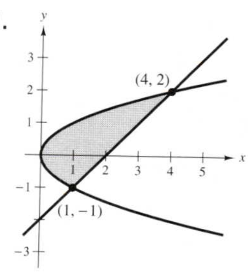
1

29.



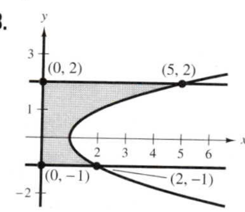
$\frac{4}{3}$

31.



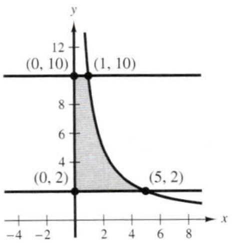
$\frac{9}{2}$

33.



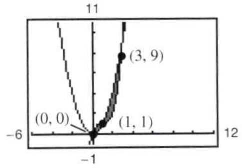
6

35.



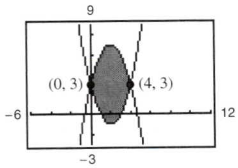
$10 \ln 5 \approx 16.094$

37. (a)



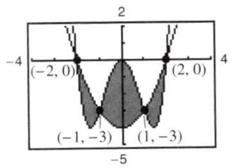
(b) $\frac{37}{12}$

39. (a)



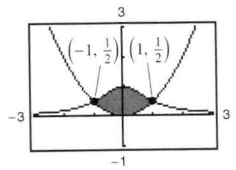
(b) $\frac{64}{3}$

41. (a)



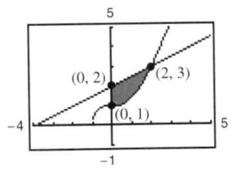
(b) 8

43. (a)



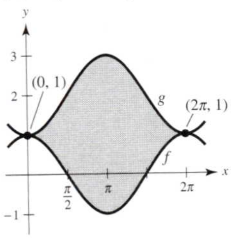
(b) $\pi/2 - 1/3 \approx 1.237$

45. (a)



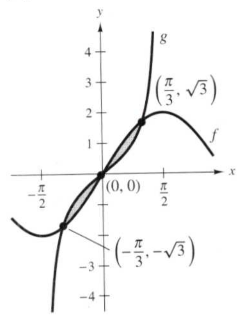
(b) ≈ 1.759

47.



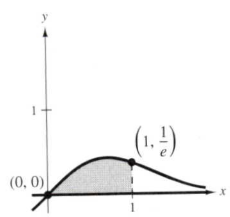
$4\pi \approx 12.566$

49.



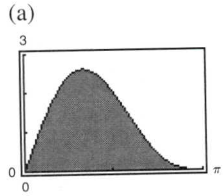
$2(1 - \ln 2) \approx 0.614$

51.



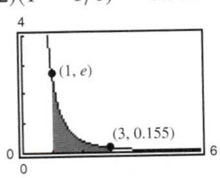
$(1/2)(1 - 1/e) \approx 0.316$

53. (a)



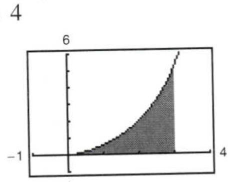
(b) 4

55. (a)



(b) About 1.323

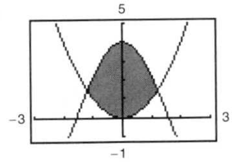
57. (a)



(b) The function is difficult to integrate.

(c) About 4.7721

59. (a)

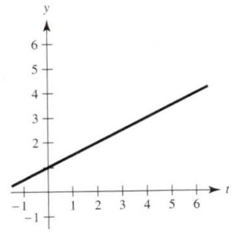


(b) The intersections are difficult to find.

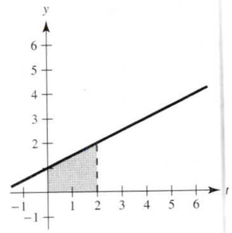
(c) About 6.3043

61. $F(x) = \frac{1}{4}x^2 + x$

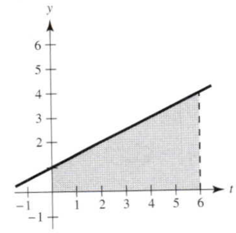
(a) $F(0) = 0$



(b) $F(2) = 3$

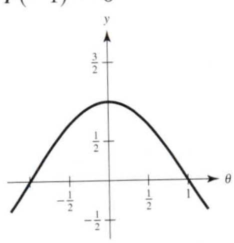


(c) $F(6) = 15$

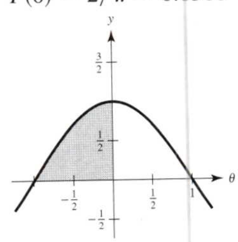


63. $F(\alpha) = (2/\pi)[\sin(\pi\alpha/2) + 1]$

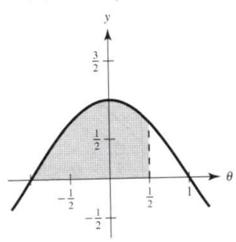
(a) $F(-1) = 0$



(b) $F(0) = 2/\pi \approx 0.6366$



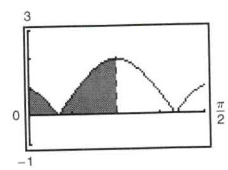
(c) $F(1/2) = (\sqrt{2} + 2)/\pi \approx 1.0868$



65. 14 **67.** 16

69. Answers will vary. Sample answers:
(a) About 966 ft^2 (b) About 1004 ft^2

71. $A = \frac{3\sqrt{3}}{4} - \frac{1}{2} \approx 0.7990$



73. $\int_{-2}^{1} [x^3 - (3x - 2)]\, dx = \frac{27}{4}$

75. $\int_0^1 \left[\frac{1}{x^2+1} - \left(-\frac{1}{2}x + 1\right)\right] dx \approx 0.0354$

77. Answers will vary. Example: $x^4 - 2x^2 + 1 \le 1 - x^2$ on $[-1, 1]$

$$\int_{-1}^{1} [(1 - x^2) - (x^4 - 2x^2 + 1)]\, dx = \frac{4}{15}$$

79. Offer 2 is better because the cumulative salary (area under the curve) is greater.

81. (a) The integral $\int_0^5 [v_1(t) - v_2(t)]\, dt = 10$ means that the first car traveled 10 more meters than the second car between 0 and 5 seconds.

The integral $\int_0^{10} [v_1(t) - v_2(t)]\, dt = 30$ means that the first car traveled 30 more meters than the second car between 0 and 10 seconds.

The integral $\int_{20}^{30} [v_1(t) - v_2(t)]\, dt = -5$ means that the second car traveled 5 more meters than the first car between 20 and 30 seconds.

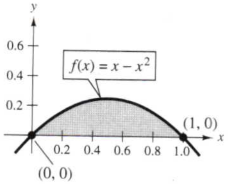
(b) No. You do not know when both cars started or the initial distance between the cars.

(c) The car with velocity v_1 is ahead by 30 meters.

(d) Car 1 is ahead by 8 meters.

83. $b = 9\left(1 - 1/\sqrt[3]{4}\right) \approx 3.330$ **85.** $a = 4 - 2\sqrt{2} \approx 1.172$

87. Answers will vary. Sample answer: $\frac{1}{6}$



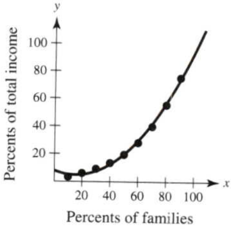
89. (a) $(-2, -11), (0, 7)$ (b) $y = 9x + 7$

(c) 3.2, 6.4, 3.2; The area between the two inflection points is the sum of the areas between the other two regions.

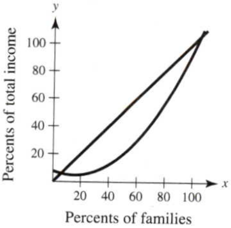
91. \$6.825 billion

93. (a) $y = 0.0124x^2 - 0.385x + 7.85$

(b)



(c)



(d) About 2006.7

95. $\frac{16}{3}\left(4\sqrt{2} - 5\right) \approx 3.503$

97. (a) About 6.031 m² (b) About 12.062 m³ (c) 60,310 lb

99. True

101. False. Let $f(x) = x$ and $g(x) = 2x - x^2$. f and g intersect at $(1, 1)$, the midpoint of $[0, 2]$, but

$$\int_a^b [f(x) - g(x)]\, dx = \int_0^2 [x - (2x - x^2)]\, dx = \frac{2}{3} \ne 0.$$

103. $\sqrt{3}/2 + 7\pi/24 + 1 \approx 2.7823$

105. Putnam Problem A1, 1993