

1. a) $2a^2 + 4ab + 2b^2 - 5a - 5b$ b) $4x^2$
2. a) $x \geq 4$ or $x \leq -1$ b) $x \neq 0, 1, -1$
3. 3 units to the left and 4 units down
4. a) $f \circ g(x) = \frac{1}{x-1}, x \geq 0, x \neq 1;$ $g \circ f(x) = \frac{1}{\sqrt{x^2-1}}, x > 1, \text{ or } x < -1$
 b) $f \circ g(x) = \frac{x^2}{(x-1)^2} + 1, x \neq 1;$ $g \circ f(x) = \frac{x^2+1}{x^2}, x \neq 0$
5. a) $(0, 0)$, no symmetry; b) no intercepts; origin
 c) $(2, 0), (-2, 0), (0, 2)$; y-axis
6. a) DNE b) 3
7. a) -1 b) $-\frac{1}{2}$ c) 4 d) $-\infty$
 e) $+\infty$ f) DNE g) 1 h) -1
 i) DNE j) 0 k) $1/3$ l) DNE
 m) 0 n) 1 o) $1/3$ p) 4
 q) $\sqrt{3}/2$ r) $-\sin x$
8. a) 15 b) $9/2$
9. a) $(-\infty, \infty)$ b) $(-\infty, -3]$ and $(-3, \infty)$
10. a) $x = 1, y = 1$ b) $x = -2, y = 1$ c) $y = 1, y = -1, x = 0$
 d) $x = 2, y = 1$
11. $f(x) = \frac{x^2-1}{x-1}, a = 1.$ $f(1)$ DNE, but $\lim_{x \rightarrow 1} f(x) = 2$
12. -112 13. $\frac{4}{9}$
14. $\frac{73}{24}$ 15. $\frac{-8}{3}$
16. $y = 3x$ 17. $(2, 6)$

18. $y + 3 = (22/21)(x - 2)$
19. $-\sqrt{3}/9$
20. $3\sqrt{2}/8$
21. $-\sqrt[3]{4}/12$
22. $1/2$
23. $-8/3$
24. $3\sqrt{3}/4$
25. $(4 + 3\sqrt{2})/(3 + 2\sqrt{2}) = \sqrt{2}$
26. $-\sqrt{3}$
27. $-9/2$
28. $[3/4, \infty)$
29. $(-3/2, 1]$
30. $(-4, 0), (3, \infty)$
31. $(-\infty, -2)$ and $(0, 2)$
32. $(3, -171/4), (-4, -256/3)$
33. None
34. At $x = 2\sqrt{2} - 3$
35. At $x = 0$
36. a) 0 and -16
36. b) 16 and 0
37. 192 ft, 6 sec, -128 ft/sec
38. 64 ft/sec, 288 ft
39. 5000 ft²
40. 80
41. 5 yd on each side
42. Overland for $5/8$ mile
43. 2 in, 128 in³
44. $33\sqrt{5}$ mph
45. 1 ft/sec
46. 39 ft/min
47. 0.0702, 0.07
48. ± 0.06 ft³
49. $7 + 1/14$
50. $0.04M$
51. 15 meters
52. a) Yes, the function $f(x) = x^5 + 2x^2 - 10x + 5$ is continuous on $[1, 2]$ and $f(1) < 0 < f(2)$.
- b) Yes, the function $f(x) = x - \sqrt{x}$ is continuous on $[4, 9]$ and $f(4) < 5 < f(9)$.
- c) Yes, the function $f(x) = x - \cos x$ is continuous on $[0, \pi]$ and $f(0) < 0 < f(\pi)$.
- d) No, the function $f(x) = x - \tan x$ is not continuous at $\frac{\pi}{2}$.
53. $f(x) = \frac{2}{3}x^3 + \frac{3}{2}x^2 - 8x + \frac{47}{6}$

54. $f(x) = \frac{1}{3}x^3 + \frac{3}{2}x^2 + 2x$

55. a) 4

b) 3

c) $f(t)$ is increasing in $[1, 4]$ and decreasing in $[0, 1]$ and $[4, 5]$

d) $(2, 2)$

56. f' , the derivative of the function shown, is increasing on $[0, 2]$ and is decreasing in $[2, 5]$, as can be seen by noting the concavity of the function, which indicates the sign of the derivative of $f'(t)$.

57. a) When time is 12 seconds.

b) 16 meters

c) 4 meters

d) 20 meters (Note: The total *displacement* is approximately 12 meters.)

e) Forward; foot on the gas

f) Backward; foot on the brake

58.

a) $\frac{1}{30}(3x^2 + 4)^5 + C$

b) $\frac{1}{16}(2x^4 + 4x)^4 + C$

c) $\frac{195}{64}$

d) $-\frac{3}{x} - \frac{3}{x^2} - \frac{2}{3x^3} + C$

e) $\frac{38}{3}$

f) $\frac{1}{3}(3x^2 - 2x + 1)^{3/2} + C$

g) $\frac{-1}{3(x+5)^3} + C$

h) $\frac{-1}{12(10x^2 + 2x + 40)^3} + C$

i) $\frac{1}{9}(6x^3 + 1)^{3/2} + C$

j) $\frac{2}{5}(2-x)^{5/2} - \frac{4}{3}(2-x)^{3/2} + C$

k) $-\frac{3}{4}(3+z^{-1})^{4/3} + C$

l) $\sin(\sec x) + C$

m) $-\frac{3}{4}\left(\cos\frac{x}{3}\right)^4 + C$

n) $\frac{1}{2}(\tan x)^2 + C$

59. a) $x^2 - 8$ b) $2x(x^4 + 6)^{5/2}$

60. $\frac{4}{15}$

61. $\frac{9}{2}$

62. $\frac{48}{5}$

63. 64π

64. $\frac{96\pi}{5}$

65. a) 8π b) $\frac{256\pi}{15}$

66. $\frac{100\pi}{3}$

67. $\frac{250}{3}$

68. $\frac{\pi}{240}$

69. $\frac{5}{2}$

70. $\frac{2}{\pi}$

71. a) 28125π b) 21093.75π

72. a) 840 b) 952.5 c) 862.5

73. $1L, 2K, 3B, 4A, 5C, 6I, 7D, 8E, 9G, 10P, 11J, 12M, 13O, 14Q, 15R, 16H$