

52. Find the second derivative of the function.

$$H(x) = x^4 \sec x$$

- A)  $H''(x) = x^2 \sec x(12 + x^2 \sec^2 x + 8x \tan x + x^2 \tan^2 x)$   
 B)  $H''(x) = x^2 \sec x(12 + x \sec^2 x + 8x \tan x + x^2 \tan^2 x)$   
 C)  $H''(x) = x^2 \sec x(12 + x^2 \sec^2 x + 4x \tan x + x^2 \tan^2 x)$   
 D)  $H''(x) = x^2 \sec x(12 + x^2 \sec^2 x + 8x \tan x + x \tan^2 x)$   
 E)  $H''(x) = x^2 \sec x(12 + x^2 \sec^2 x + 8x \tan x + x^2 \tan x)$

53. Given the derivative below find the requested higher-order derivative.

$$f''(x) = 4x^{\frac{5}{3}}, \quad f^{(iv)}(x)$$

- A)  $f^{(iv)}(x) = \frac{160}{81}x^{\frac{-8}{3}}$   
 B)  $f^{(iv)}(x) = \frac{5}{81}x^{\frac{-8}{3}}$   
 C)  $f^{(iv)}(x) = \frac{160}{81}x^{\frac{-7}{3}}$   
 D)  $f^{(iv)}(x) = \frac{36}{81}x^{\frac{-7}{3}}$   
 E) None of the above

54. Find the derivative of the function.

$$f(t) = (1 - 3t^4)^3$$

- A)  $f'(t) = -36t^2(1 - 3t^4)^2$   
 B)  $f'(t) = -4t^3(1 - 3t^3)^2$   
 C)  $f'(t) = -3t^4(1 - 3t^4)^2$   
 D)  $f'(t) = -36t^3(1 - 3t^4)^2$   
 E)  $f'(t) = -36t^3(1 - 3t^3)^2$

55. Find the derivative of the function.

$$f(t) = (2 + 3t)^{\frac{6}{5}}$$

- A)  $f'(t) = \frac{2}{5}(2 + 3t)^{\frac{1}{5}}$   
 B)  $f'(t) = 3(2 + 3t)^{\frac{1}{5}}$   
 C)  $f'(t) = \frac{18}{5}(2 + 3t)^{\frac{1}{6}}$   
 D)  $f'(t) = \frac{3}{5}(2 + 3t)^{\frac{1}{5}}$   
 E)  $f'(t) = \frac{18}{5}(2 + 3t)^{\frac{1}{5}}$

56. Find the derivative of the function.

$$f(x) = x^6(4 + 5x)^5$$

A)  $f'(x) = x^4(4 + 5x)^5(24 + 55x)$

B)  $f'(x) = 5x^6(4 + 5x)^4(24 + 55x)$

C)  $f'(x) = x^5(4 + 5x)^5(24 + 55x)$

D)  $f'(x) = x^5(4 + 5x)^4(24 + 55x)$

E)  $f'(x) = x^5(4 + 5x)^4(24 + 5x)$

57. Find the derivative of the function.

$$f(x) = x^8\sqrt{1-6x}$$

A)  $f'(x) = \frac{x^7(16-102x)}{2\sqrt{1-6x}}$

B)  $f'(x) = \frac{x^7(16+102x)}{2\sqrt{1-6x}}$

C)  $f'(x) = \frac{x^7(1-102x)}{2\sqrt{1-6x}}$

D)  $f'(x) = \frac{x^7(16-6x)}{2\sqrt{1-6x}}$

E)  $f'(x) = \frac{x^7(1+6x)}{2\sqrt{1-6x}}$

58. Find the derivative of the function.

$$f(x) = x^5\sqrt{8-2x}$$

A)  $f'(x) = \frac{x^4(80-22x)}{2\sqrt{8-2x}}$

B)  $f'(x) = \frac{x^4(80+22x)}{2\sqrt{8-2x}}$

C)  $f'(x) = \frac{x^4(8-22x)}{2\sqrt{8-2x}}$

D)  $f'(x) = \frac{x^4(80-2x)}{2\sqrt{8-2x}}$

E)  $f'(x) = \frac{x^4(8+2x)}{2\sqrt{8-2x}}$

59. Find the derivative of the function.

$$g(x) = \left( \frac{x+3}{x^2+6} \right)^8$$

A)  $g'(x) = \frac{8(6-6x+x^2)}{(3+x)(6+x^2)} \left( \frac{(3+x)}{(6+x^2)} \right)^8$

B)  $g'(x) = \frac{8(6+6x-x^2)(3+x)^7}{(6+x^2)^9}$

C)  $g'(x) = \frac{8(6-6x-x^2)(3+x)^9}{(6+x^2)^7}$

D)  $g'(x) = -\frac{8(6-6x-x^2)(3+x)^7}{(6+x^2)^9}$

E)  $g'(x) = \frac{8(6-6x-x^2)(3+x)^7}{(6+x^2)^9}$

60. Find the derivative of the function.

$$y = 8 \cos 3x$$

A)  $y' = -24 \sin 3x$

B)  $y' = 24 \sin 3x$

C)  $y' = -8 \sin 3x$

D)  $y' = -24 \cos 3x$

E)  $y' = -3 \sin 3x$

61. Find the derivative of the function.

$$y = \cos(6x^4 - 4)$$

A)  $y' = -24 \sin(6x^4 - 4)$

B)  $y' = -24x^3 \sin(6x^4 - 4)$

C)  $y' = 24 \sin(6x^4 - 4)$

D)  $y' = 24x^4 \cos(6x^4 - 4)$

E)  $y' = -6 \sin(6x^4 - 4)$

62. Find the derivative of the function.

$$y = 3 \sin 4x$$

A)  $y' = 3 \cos 4x$

B)  $y' = 12 \sin 4x$

C)  $y' = -3 \cos 4x$

D)  $y' = -12 \cos 4x$

E)  $y' = 12 \cos 4x$

63. Find the derivative of the function.

$$f(\theta) = \frac{5}{13} \sin^2 5\theta$$

A)  $f'(\theta) = \frac{5 \sin 5\theta \cos 5\theta}{13}$

B)  $f'(\theta) = \frac{50 \sin 5\theta \cos 5\theta}{13}$

C)  $f'(\theta) = \frac{50 \cos 5\theta}{13}$

D)  $f'(\theta) = -\frac{50 \sin 5\theta \cos 5\theta}{13}$

E)  $f'(\theta) = \frac{50 \sin 5\theta}{13}$

64. Find the derivative of the function.

$$y = \frac{4}{3} \sec^2 x$$

A)  $y' = -\frac{8}{3} \sec^2 x \tan x$

B)  $y' = \frac{8}{3} \sec^2 x \tan^2 x$

C)  $y' = \frac{4}{3} \sec^2 x \tan x$

D)  $y' = \frac{8}{3} \sec^2 x \tan x$

E)  $y' = \frac{8}{3} \sec x \tan x$

65. Find the derivative of the function.

$$f(t) = 3 \sec^2 (5\pi t - 3)$$

A)  $f'(t) = 30\pi \sec^2 (5\pi t - 3) \tan (5\pi t - 3)$

B)  $f'(t) = 30 \sec^2 (5\pi t - 3) \tan (5\pi t - 3)$

C)  $f'(t) = 5\pi \sec^2 (5\pi t - 3) \tan (5\pi t - 3)$

D)  $f'(t) = 15\pi \sec^2 (5\pi t - 3) \tan (5\pi t - 3)$

E)  $f'(t) = 30\pi \sec^2 (5\pi t - 3) \tan (3 - 5\pi t)$

66. Evaluate the derivative of the function at the given point.

$$y = \sqrt[5]{4x^2 + 3x}, \quad x = 3$$

A)  $y'(3) = \frac{27}{5(45)^{\frac{6}{5}}}$

D)  $y'(3) = \frac{27}{5(45)^{\frac{4}{5}}}$

B)  $y'(3) = \frac{27}{5(45)^{\frac{3}{5}}}$

E)  $y'(3) = \frac{27}{(45)^{\frac{4}{5}}}$

C)  $y'(3) = \frac{27}{10(45)^{\frac{4}{5}}}$

67. Evaluate the derivative of the function at the given point.

$$f(t) = \frac{5t+3}{2t-1}, \quad \left(2, \frac{13}{3}\right)$$

A)  $f'(2) = \frac{11}{9}$

D)  $f'(2) = -\frac{11}{9}$

B)  $f'(2) = -\frac{11}{3}$

E)  $f'(2) = -\frac{11}{25}$

C)  $f'(2) = \frac{11}{3}$

68. Evaluate the derivative of the function at the given point.

$$f(t) = \frac{7t^2+2}{4t-1}, \quad \left(4, \frac{38}{5}\right)$$

A)  $f'(4) = \frac{128}{5}$

D)  $f'(4) = -\frac{128}{75}$

B)  $f'(4) = -\frac{128}{5}$

E)  $f'(4) = \frac{128}{1125}$

C)  $f'(4) = \frac{128}{75}$

69. Evaluate the derivative of the function at the given point.

$$f(t) = \frac{9}{t-1}, \quad \left(3, \frac{9}{2}\right)$$

A)  $f'(3) = -\frac{9}{4}$

D)  $f'(3) = \frac{9}{2}$

B)  $f'(3) = -\frac{9}{2}$

E)  $f'(3) = -\frac{9}{8}$

C)  $f'(3) = \frac{9}{4}$

70. Find an equation to the tangent line to the graph of  $f$  at the given point.

$$f(x) = \tan^4 x, \quad \left(\frac{8\pi}{9}, 0.018\right)$$

The coefficients below are given to two decimal places.

A)  $y = 0.22x + 0.63$

D)  $y = 0.21x + 0.63$

B)  $y = -0.22x - 0.63$

E)  $y = 0.21x - 0.63$

C)  $y = -0.22x + 0.63$

71. Find an equation to the tangent line for the graph of  $f$  at the given point.

$$f(x) = (2x^3 + 8)^2, \quad (-1, 36)$$

A)  $y = 72x + 108$

D)  $y = 36x + 108$

B)  $y = 72x - 108$

E)  $y = 36x - 108$

C)  $y = -72x + 108$

72. Find the second derivative of the function.

$$f(x) = (4x^4 + 6)^5$$

A)  $f''(x) = 80x^2(6 + 4x^4)^3(18 + 80x^4)$

D)  $f''(x) = 80x^2(6 + 4x^4)^3(18 + 76x^4)$

B)  $f''(x) = 80x^2(6 + 4x^4)^3(18 + 76x^4)$

E)  $f''(x) = 80x^2(6 + 4x^4)^3(18 - 76x^4)$

C)  $f''(x) = 80x^2(6 + 4x^4)^3(18 + 76x^4)$

73. Find the second derivative of the function.

$$f(x) = \sin 5x^5$$

- A)  $f'(x) = 125x^3 \cos 5x^5 - 625x^8 \sin 5x^5$     D)  $f'(x) = 25x^3 \cos 5x^5 - 625x^8 \sin 5x^5$   
 B)  $f'(x) = 100x^3 \cos 5x^5 + 625x^8 \sin 5x^5$     E)  $f'(x) = 25x^3 \cos 5x^5 + 25x^8 \sin 5x^5$   
 C)  $f'(x) = 100x^3 \cos 5x^5 - 625x^8 \sin 5x^5$

74. Find  $dy/dx$  by implicit differentiation.

$$x^2 + y^2 = 9$$

- A)  $\frac{dy}{dx} = \frac{x}{y}$     B)  $\frac{dy}{dx} = -\frac{x}{y}$     C)  $\frac{dy}{dx} = -\frac{y}{x}$     D)  $\frac{dy}{dx} = \frac{y}{x}$     E) None of the above

75. Find  $dy/dx$  by implicit differentiation.

$$x^2 + 9x + 9xy - y^2 = 16$$

- A)  $\frac{dy}{dx} = \frac{x+9+9y}{y-9x}$     D)  $\frac{dy}{dx} = \frac{2x+9-9y}{2y-9x}$   
 B)  $\frac{dy}{dx} = \frac{2x+9+9y}{2x-9y}$     E)  $\frac{dy}{dx} = \frac{2x+9+9y}{2y-9x}$   
 C)  $\frac{dy}{dx} = \frac{2x-9+9y}{2y-9x}$

76. Find  $dy/dx$  by implicit differentiation.

$$x^{2/5} + y^{3/2} = 4$$

- A)  $\frac{dy}{dx} = -\frac{4x^{-3/5}}{30y^{1/2}}$     D)  $\frac{dy}{dx} = -\frac{4x^{-3/5}}{15y^{1/2}}$   
 B)  $\frac{dy}{dx} = \frac{4x^{-3/5}}{15y^{1/2}}$     E) None of the above  
 C)  $\frac{dy}{dx} = -\frac{12x^{-3/5}}{15y^{1/2}}$

77. Find  $dy/dx$  by implicit differentiation.

$$x^6 + 10x + 5xy - y^7 = 4$$

A)  $\frac{dy}{dx} = \frac{6x^5 + 10 - 5y}{7y^6 - 5x}$

B)  $\frac{dy}{dx} = \frac{5x^5 + 10 + 5y}{7y^6 - 5x}$

C)  $\frac{dy}{dx} = \frac{6x^5 + 10 + 5y}{6y^6 - 5x}$

D)  $\frac{dy}{dx} = -\frac{6x^5 + 10 + 5y}{7y^6 - 5x}$

E)  $\frac{dy}{dx} = \frac{6x^5 + 10 + 5y}{7y^6 - 5x}$

78. Find  $dy/dx$  by implicit differentiation.

$$x^6 + 8x + x^5y - y^5 = 9$$

A)  $\frac{dy}{dx} = \frac{6x^5 + 8 + x^5y}{5y^4 - x^5}$

B)  $\frac{dy}{dx} = \frac{6x^5 + 8 + 5x^4y}{5y^4 - x^5}$

C)  $\frac{dy}{dx} = \frac{6x^5 + 8 + 5y}{4y^4 - 5x}$

D)  $\frac{dy}{dx} = \frac{6x^5 - 8 + 5x^4y}{5y^4 - x^5}$

E)  $\frac{dy}{dx} = \frac{6x^5 + 8 + 5x^4y}{4y^4 - x^5}$

79. Find  $dy/dx$  by implicit differentiation.

$$\sin x + 4 \cos 5y = 4$$

A)  $\frac{dy}{dx} = \frac{\cos x}{20 \sin 5y}$

B)  $\frac{dy}{dx} = -\frac{\cos x}{20 \sin 5y}$

C)  $\frac{dy}{dx} = \frac{\cos x}{5 \sin 5y}$

D)  $\frac{dy}{dx} = \frac{\cos x}{20 \cos 5y}$

E)  $\frac{dy}{dx} = \frac{\cos x}{20 \sin y}$



80. Find  $dy/dx$  by implicit differentiation and evaluate it at the given point.

$$x^4 - 6y^2 = -6, \quad \left(5, \sqrt{\frac{631}{6}}\right)$$

A)  $\frac{dy}{dx}\bigg|_{x=5} = \frac{250}{3\left(\sqrt{\frac{631}{6}}\right)}$

D)  $\frac{dy}{dx}\bigg|_{x=5} = \frac{125}{3\left(\sqrt{\frac{631}{6}}\right)}$

B)  $\frac{dy}{dx}\bigg|_{x=5} = \frac{3125}{3\left(\sqrt{\frac{631}{6}}\right)}$

E) None of the above

C)  $\frac{dy}{dx}\bigg|_{x=5} = \frac{6250}{3\left(\sqrt{\frac{631}{6}}\right)}$

81. Find an equation of the tangent line to the graph of the function given below at the given point.

$$(y-10)^2 = 2(x-2), \quad (52.00, 0.00).$$

(The coefficients below are given to two decimal places.)

A)  $y = 0.1x + 5.20$

D)  $y = -0.10x + 5.20$

B)  $y = -0.10x + 150.80$

E)  $y = 2.90x + 150.80$

C)  $y = 2.90x - 150.80$

82. Find an equation of the tangent line to the graph of the function given below at the given point.

$$7x^2 - 2xy + 6y^2 - 60 = 0, \quad (-2, 2)$$

(The coefficients below are given to two decimal places.)

A)  $y = -1.14x + 4.29$

D)  $y = 4.14x - 10.29$

B)  $y = 1.14x + 10.29$

E)  $y = 4.14x + 10.29$

C)  $y = 1.14x + 4.29$

83. Find  $d^2y/dx^2$  in terms of  $x$  and  $y$ .

$$x^2 + y^2 = 6$$

A)  $\frac{d^2y}{dx^2} = -\frac{6}{y^3}$

D) Both A and C

B)  $\frac{d^2y}{dx^2} = \left(-\frac{x}{y}\right)^2$

E) None of the above

C)  $\frac{d^2y}{dx^2} = -\frac{\frac{x^2}{y} + y}{y^2}$

84. Find  $d^2y/dx^2$  in terms of  $x$  and  $y$ .

$$2 - 8xy = 9x - 5y$$

A)  $\frac{d^2y}{dx^2} = \frac{16(8y-9)}{(5-8x)^2}$

D)  $\frac{d^2y}{dx^2} = \frac{16(8+9y)}{(5+8x)^2}$

B)  $\frac{d^2y}{dx^2} = \frac{464}{(5-8x)^3}$

E) None of the above

C)  $\frac{d^2y}{dx^2} = \frac{16(8y+9)}{(5+8x)^2}$

85. Find the points at which the graph of the equation has a vertical or horizontal tangent line.

$$2x^2 + 2y^2 - 20x + 12y + 3 = 0$$

A) There is a horizontal tangent at  $x = 5$  but no vertical tangents.

B) There is a horizontal tangent at  $x = 4$  and a vertical tangent at  $y = 1$ .

C) There is a vertical tangent at  $y = -3$  but no horizontal tangents.

D) There is a horizontal tangent at  $x = 5$  and a vertical tangent at  $y = -3$ .

E) There are no horizontal or vertical tangent lines.

86. A point is moving along the graph of the function

$$y = 2x^2 + 3$$

such that  $dx/dt = 4$  centimeters per second.

Find  $dy/dt$  for the given values of  $x$ .

(a)  $x = 2$

(b)  $x = 4$

A)  $\frac{dy}{dt} = 2$

$\frac{dy}{dt} = 64$

B)  $\frac{dy}{dt} = 32$

$\frac{dy}{dt} = 64$

C)  $\frac{dy}{dt} = 64$

$\frac{dy}{dt} = 32$

D)  $\frac{dy}{dt} = 4$

$\frac{dy}{dt} = -32$

E)  $\frac{dy}{dt} = 4$

$\frac{dy}{dt} = 64$

87. A point is moving along the graph of the function

$$y = \frac{1}{8x^2 + 3}$$

such that  $dx/dt = 3$  centimeters per second.

Find  $dy/dt$  when  $x = 3$ .

A)  $\frac{dy}{dt} = -\frac{16}{1875}$

B)  $\frac{dy}{dt} = -\frac{16}{625}$

C)  $\frac{dy}{dt} = \frac{16}{625}$

D)  $\frac{dy}{dt} = \frac{16}{1875}$

E)  $\frac{dy}{dt} = -\frac{48}{25}$

88. A point is moving along the graph of the function

$$y = \sin 9x$$

such that  $dx/dt = 3$  centimeters per second.

Find  $dy/dt$  when  $x = \frac{\pi}{5}$ .

- A)  $\frac{dy}{dt} = 9 \cos\left(\frac{3\pi}{5}\right)$                       D)  $\frac{dy}{dt} = 9 \cos\left(\frac{9\pi}{5}\right)$   
 B)  $\frac{dy}{dt} = 27 \cos\left(\frac{9\pi}{5}\right)$                       E)  $\frac{dy}{dt} = 27 \cos\left(\frac{3\pi}{5}\right)$   
 C)  $\frac{dy}{dt} = 27 \cos\left(\frac{27\pi}{5}\right)$

89. **Area** The radius,  $r$ , of a circle is decreasing at a rate of 4 centimeters per minute.

Find the rate of change of area,  $A$ , when the radius is 5

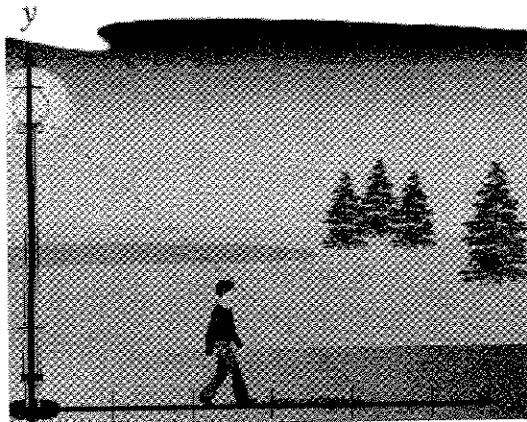
- A)  $\frac{dA}{dt} = -20\pi$                       D)  $\frac{dA}{dt} = -40\pi$   
 B)  $\frac{dA}{dt} = -200\pi$                       E)  $\frac{dA}{dt} = 40\pi$   
 C)  $\frac{dA}{dt} = 200\pi$

90. **Depth** A conical tank (with vertex down) is 12 ft across the top and 18 ft deep. If water is flowing into the tank at a rate of 9 cubic ft per minute, find the rate of change of depth of water when the water is 6 ft deep.

- A)  $\frac{27}{2\pi}$  ft per minute                      D)  $\frac{9}{8\pi}$  ft per minute  
 B)  $\frac{27}{2\pi}$  ft per minute                      E) None of the above  
 C)  $\frac{9}{4\pi}$  ft per minute

91. **Shadow Length** A man 5 feet tall walks at a rate of 3 ft per second away from a light that is 16 ft above the ground (see figure). When he is 10 ft from the base of the light find the following.

- (a) The rate the tip of the shadow is moving.  
 (b) The rate the length of his shadow is changing.



- |                                  |                               |
|----------------------------------|-------------------------------|
| (a)                              | (b)                           |
| A) $\frac{24}{11}$ ft per minute | $\frac{81}{11}$ ft per minute |
| B) $\frac{24}{11}$ ft per minute | $\frac{15}{11}$ ft per minute |
| C) $\frac{48}{11}$ ft per minute | $\frac{81}{11}$ ft per minute |
| D) $\frac{48}{11}$ ft per minute | $\frac{15}{11}$ ft per minute |
| E) None of the above             |                               |