

1. Find the equation of the tangent line to the curve $y = \frac{-1}{\sqrt{x+1}}$ at $x = 4$.

2. (1 pt each) True or False:

(a) When f is decreasing, the graph of f' lies below the x -axis.

(b) If f is continuous, then f is differentiable.

(c) If f and g are differentiable, then $\frac{d}{dx}[f(g(x))] = f(x)g'(x) + g(x)f'(x)$.

(d) The derivative $f'(a)$ is the average rate of change of $y = f(x)$ with respect to x when $x = a$.

(e) $\frac{d}{dx}(\sin^2 x + \cos^2 x) = 0$.

3. Given $g(x) = \sin 2x + \cos x$ find $g''\left(\frac{3\pi}{4}\right)$.

4. Find the derivative. (Do not simplify)

(a) $y = \sqrt[3]{x^2} + \frac{3x^4}{2} + 9x^2 - \frac{7}{x^5} + \frac{1}{\sqrt{x}}$

(b) $y = \cos^3 4x + (3x^2 + 1)^{7/4}$

(c) $y = (3x^2 - 7x + 2)^4 (5x + 7)^6$

(d) $y = \sin(3x + 5) \cos(7x^2 - x + 3)$

(e) $y = \sqrt[5]{\frac{2x^2 - 7x + 8}{x^3 - 2x + 6}}$

(f) $y = \csc x^3 + 3x \tan^2 x$

(g) $y = \sec(\cot(x^4 + 6x))$

(h) $y = \frac{7}{(x^5 + 3)^4 + 6}$

5. Find y' by implicit differentiation if $y^6 + 3x^2 = \cos y + x^2 y^3$.

6. Find all values of x (in radians) for which $y = \cos^2 x - \sqrt{3} \sin x$ has a horizontal tangent.

7. A painter is painting a house using a ladder 12 feet long. A dog runs by the ladder dragging

a leash that catches the bottom of the ladder and drags it directly away from the house at 24 ft/sec. Assuming that the ladder continues to be pulled away at this speed, how fast is the top of the ladder moving down the wall when the top is 5 feet from the ground?

8. A particle moves according to the distance function $s(t) = t^3 - 9t^2 + 15t + 10$

(a) Find the velocity at time t .

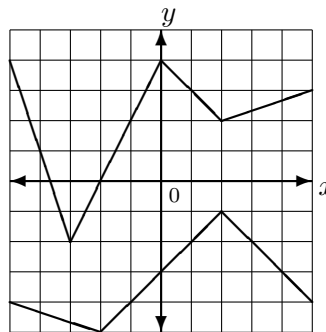
(b) Find the acceleration at time t .

(c) When is the particle at rest?

(d) When is the particle moving in a positive direction?

(e) Find the total distance traveled in the first 10 seconds. (SET UP ONLY)

9. The graphs of f and g are shown below. (NOTE: f is the top graph and g is the bottom graph.)



(a) Find $f'(-1)$

(b) Find $g'(-1)$

(c) Let $F(x) = f(x)g(x)$. Compute $F'(-1)$

(d) Let $G(x) = f(g(x))$. Compute $G'(-1)$

ANSWERS

1. $y = \frac{1}{18}x + \frac{1}{9}$

2. (a) T
 (b) F
 (c) F
 (d) F
 (e) T

3. $4 + \frac{\sqrt{2}}{2}$

4. (a) $y' = \frac{2}{3}x^{-1/3} + 6x^3 + 18x + 35x^{-6} - \frac{1}{2}x^{-3/2}$

(b) $y' = 3(\cos^2 4x)(-4 \sin 4x) + \frac{7}{4}(3x^2 + 1)^{3/4}(6x)$

(c) $y' = 30(3x^2 - 7x + 2)^4(5x + 7)^5 + 4(5x + 7)^6(3x^2 - 7x + 2)^3(6x - 7)$

(d) $y' = [\sin(3x + 5)][-\sin(7x^2 - x + 3)](14x - 1) + 3[\cos(7x^2 - x + 3)][\cos(3x + 5)]$

(e) $y' = \frac{1}{5} \left(\frac{2x^2 - 7x + 8}{x^3 - 2x + 6} \right)^{-4/5} \left(\frac{(x^3 - 2x + 6)(4x - 7) - (2x^2 - 7x + 8)(3x^3 - 2)}{(x^3 - 2x + 6)^2} \right)$

(f) $y' = (-\csc x^3 \cot x^3)(3x^2) + 6x \tan x \sec^2 x + 3 \tan^2 x$

(g) $y' \sec(\cot(x^4 + 6x)) \tan(\cot(x^4 + 6x)) (-\csc^2(x^4 + 6x)) (4x^3 + 6)$

(h) $y' = -28 [(x^5 + 3)^4 + 6]^{-2} (x^5 + 3)^3 (5x^4)$

5. $y' = \frac{2xy^3 - 6x}{6y^5 + \sin y - 3x^2y^2}$

6. $x = \frac{\pi}{2} + k\pi; \quad x = \frac{4\pi}{3} + 2k\pi; \quad x = \frac{5\pi}{3} + 2k\pi$

7. $\frac{dy}{dt} = \frac{-24\sqrt{119}}{5} \text{ ft/sec}$

8. (a) $v(t) = s'(t) = 3t^2 - 18t + 15$

(b) $a(t) = 6t - 18$

(c) $t = 1; \quad t = 5$

(d) $0 \leq t < 1; \quad t > 5$

(e) $|s(1) - s(0)| + |s(5) - s(1)| + |s(10) - s(5)|$

9. (a) 2
 (b) 1
 (c) -6
 (d) -3