

14.1 Worksheet #2

Derivatives and Physics

Find each derivative.

1. $y = 2\pi$

2. $f(x) = \frac{3x-4}{x}$

3. $g(x) = \frac{3x^5 + 7x^2 - x}{x^3}$

4. $s(x) = 6x(2x+3)^2$

5. $y = 2\sin x - 3\cos x$

6. $f(t) = t^{1/3} + 5t^{3/5}$

For problems #7 and 8, find the equation of the tangent line to the given function at the given value. Use your calculator to check your results.

7. $f(x) = \frac{1}{x^2}$ at $x = -2$

8. $f(x) = \sqrt{3}x + \sin x$ at $(0,0)$

9. Where does $f(x) = 2x - \cos x$ have horizontal tangents on $0 \leq x < 2\pi$?

10. a. Find the average rate of change of $f(t) = 4t^2 + 1$ on the interval $[1,4]$ seconds.
- b. Find the instantaneous rate of change of $f(t) = 4t^2 + 1$ at 1 second and also at 4 seconds.
11. a. Find the average rate of change of $f(x) = 2\sin x$ on the interval $\left[0, \frac{\pi}{6}\right]$ seconds.
- b. Find the instantaneous rate of change of $f(x) = 2\sin x$ at $\frac{\pi}{6}$ seconds.
12. A ball is thrown upward with an initial velocity of 30 feet per second from the top of a building 120 feet tall.
- a. Give the position function for this ball. b. Give the velocity function for this ball.
- c. Find the average velocity of the ball over the interval $[1,3]$ seconds.
- d. Find the instantaneous velocity of the ball at time 1 second and time 3 seconds.
- e. At what time does the ball hit the ground?
- f. What is the velocity of the ball as it strikes the ground?