Derivatives Practice test

Evaluate

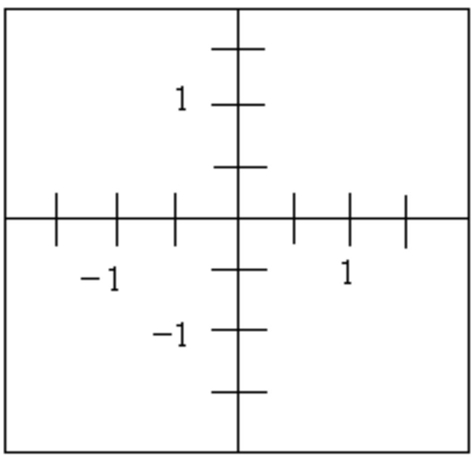
1. $\lim_{x \to 0} x \cdot \csc x$

2. $\lim_{x \to -\infty} \frac{x+1}{x-1}$

3. Sketch a graph that uses the following conditions. Pay attention to how the graph is labeled.

$\lim_{x \to 0^+}$ f (x) = ∞, $\lim_{x \to 0^-}$ f (x) = - ∞,

$\lim_{x \to \infty}$ f (x) = 1, $\lim_{x \to -\infty}$ f (x) = 1



4. Use the given table to find the following.

x	3	-1	2
$f(x)$	5	-2	3
$g(x)$	-1	2	7
$f'(x)$	-3	1	0
$g'(x)$	6	2	-3

a. Find $h'(2)$, if $h(x) = f(x)g(x)$

b. Find $h'(3)$, if $h(x) = f(g(x))$

Find the derivative

5. $y = xe^{x^3}$

6. $g(x) = x\sin(x^2)$

7. $y = \ln(\sec x)$

8. $y = x^{1-x}$

9. $y = \dfrac{x^4 e^x}{(x-1)^3}$

10. $y + 12x = xy^5 + \tan(y)$

11. Find the equation of the of the tangent line of f(x) = sin(x) at x = π.

12. Find the approximate value of f(2.1) through the process of linearization using the equation $f(x) = 3x^2 - 5$, at x = 2.

13. Consider the function $y = 3x^5 - 20x^3$,
    a) Find all the critical numbers, then use the First Derivative Test to identify which of these occur at maximum points and which occur at minimum points
    b) Find all points of inflection and identify the intervals where the function is concave up and where it is concave down.

Use the Second Derivative Test to verify your answers from part a).

14. Find the value of *c* (if it exists) that satisfies the Mean Value Theorem for the function $y = \dfrac{1}{x}$ on the following intervals:

a) [1 , 3]   b) [–1 , 1]

15. A point moves along a horizontal coordinate line (number line) in such a way that its position at time *t* is specified by

$s(t) = t^3 - 9t^2 + 24t$, *s* is measured in feet and *t* in seconds.

a) What is the position of the point at t= 2?

b) When is the velocity = 0?

c) When is the acceleration = 0?

d) What is the total distance traveled in the first 5 seconds?

e) Use a sign chart to determine when the point is speeding up.

16. A function is discontinuous at x = -2, x = 0, and x = 2. For each of these, determine the discontinuity type (removable, jump, or infinite) based on the following information:

a) at x = -2	b) x = 0	c) x = 2
$\lim_{x\to -2} f(x) = -1$	$\lim_{x\to 0^-} f(x) = -\infty$	$\lim_{x\to 2^-} f(x) = -1$
$f(-2) = 0$	$\lim_{x\to 0^+} f(x) = \infty$	$\lim_{x\to 2^+} f(x) = 1$
Type? ________________	Type? ________________	Type? ____________

17.A person is sitting on a park bench and watching a balloon rising up in the air 110 meters away from him. The balloon is rising at a constant rate of 5 m/sec. The person moves his in order to keep the balloon in sight. How fast is the person moving his head when the balloon is at a height of 50 meters?

18. Which point(s), (not just x-coord), on the graph of $y = 4 - x^2$ are closest to the point (0,2)? Do not forget to confirm your answer.