Math 152 Learning Target Quiz 7

April 2, 2021

Name: _____

Instructions: Read the following instructions carefully.

- You do not need to complete every question. Choose the learning targets that are most important for you and focus on those.
- **You must show ALL of your work in order to earn full credit on any of the learning targets.**
- You may use any calculator you wish, so long as it does not have communications abilities (e.g., iPods, iPads, smartphones, laptops, etc.) or symbolic manipulation capabilities (e.g., TI-89).
- You may not use any notes, notecards, books, formula sheets, etc.
- Feel free to ask any questions you want – especially if instructions are unclear, or if you want advice about which learning targets to attempt.

Learning Target	Assessment	Learning Target	Assessment
10		16	
11		17	
12		18	
13		19	
14		20	
15		21	

Find the equation of a tangent line.

10. Find an equation of the line tangent to $f(x) = \sin(x)$ at the point $(\pi, 0)$.

Given information about two or more functions (either graphs or values, but not the equations), answer questions about new functions involving those functions and their derivatives.

11. Values of f, f', g, and g' are given in the table. Let $u(x) = f(g(x))$ and $v(x) = f(x)/g(x)$.

    a. Find $u'(3)$.

    b. Find $v'(3)$.

	$f(x)$	$f'(x)$	$g(x)$	$g'(x)$
$x = 1$	3	4	2	6
$x = 2$	1	5	8	7
$x = 3$	7	7	2	9

Find dy/dx for a function given implicitly.

12. Find $\frac{dy}{dx}$ given $\cos(xy) = 2x + y$.

Use L'Hopital's Rule to evaluate limits involving indeterminate forms.

13. Find $\lim_{x \to 0} \frac{\sin(x)}{\cos(x)-1}$.

Find the intervals where a function is increasing/decreasing and identify the relative maximums and minimums of the function.

14. Use calculus to find the intervals where the function $f(x) = x^2 - 4x$ is increasing/decreasing and identify its relative maximums and minimums.

Find the intervals where a function is concave up/down and identify the inflection points of the function.

15. Use the methods of calculus to find the intervals where a function is concave up/down and identify the inflection points of the function $g(x) = 12 + 6x^2 - x^3$.

Use the second derivative test to identify the local maximums and minimums of a function.

16. Use the second derivative test to identify the local maximums and minimums of $f(x) = -8x^3 - x^4$.

Given information about a function (but not its equation), answer questions about the function, its first derivative, and its second derivative.

17. Suppose $f(x)$ is a function satisfying:

- $f'(-2) = f'(0) = 0$,
- $f'(x) > 0$ if $x < -2$ or $x > 0$
- $f'(x) < 0$ if $-2 < x < 0$
- $f''(x) > 0$ if $1 < x < 3$
- $f''(x) < 0$ if $x < 1$ or $x > 3$

a. Identify the critical points of $f(x)$ and classify each as a maximum or a minimum.
b. Identify the points of inflection of $f(x)$.
c. On which interval(s) is $f(x)$ concave up? Concave down?

Given a family of functions, answer questions about the function and its derivative.

18. Let $f(x) = x^2 + ax, where $a > 0$.

    a. Find the critical numbers of f; your answer should be a formula in terms of a.
    b. Compute f'' and find all *possible* points of inflection. You do not need to confirm whether each possibility is, in fact, a point of inflection.

Given a function and a closed interval, identify the absolute maximum and minimum on that interval.

19. Use the methods of calculus to find the absolute minimum and maximum of $g(x) = x^2 - 4x$ on the interval $[1, 3]$.

Solve an applied optimization problem.

20. A farmer wishes to enclose a rectangular field with a fence. The cost of the fencing of the sides that run north-south is \$10/ft, while the cost of the east-west fence on the north side is \$7/foot, and the cost of the east-west fence along the south side is \$2/foot. If the farmer wants to spend \$700, determine the dimensions of the field that will maximize the enclosed area.

Solve a related rates problem.

21. A person is standing 350 feet away from a model rocket that is fired straight up in the air at a speed of 15 ft/s. At what rate is the distance between the person and the rocket increasing 20 seconds after liftoff?