



Test #2

Name: (print neatly) _____

Instructor: _____

(sign) _____

1. (8 pts) Let $f(x)$ be a function.

a) State the definition of the derivative of $f(x)$, $f'(x)$, in terms of limits.

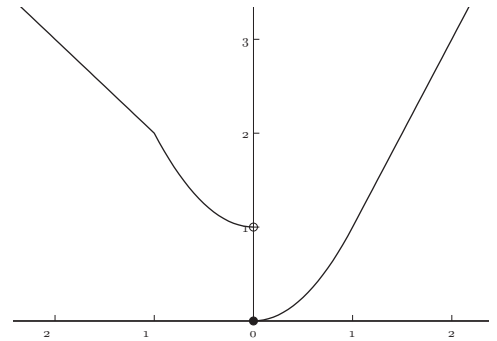
b) Use that definition of the derivative to compute $f'(x)$ if $f(x) = 5x^2 - x$.

Do not use the rules for sums, differences, powers, etc., for this problem.

2. (6 pts) Let $f(x)$ be defined by

$$f(x) = \begin{cases} -x + 1 & \text{for } x \leq -1, \\ x^2 + 1 & \text{for } -1 < x < 0, \\ x^2 & \text{for } 0 \leq x < 1, \\ 2x - 1 & \text{for } 1 \leq x. \end{cases}$$

a) For which values of x is $f(x)$ *not* continuous?



b) For which values of x is $f(x)$ *not* differentiable?

3. (6 pts) Let $f(t) = 3 \tan(t)$ be defined by

a) What is the average rate of change of $f(t)$ on the interval $[0, \pi/3]$?

b) What is the instantaneous rate of change of $f(t)$ with respect to t at $t = \pi/6$?

4. (10 pts) Suppose that $f(x)$ and $g(x)$ are differentiable functions and that $f(2) = 2$, $g(2) = 4$, $f'(2) = 8$ and $g'(2) = 16$.

For each of the following, compute the derivative at $x = 2$, or explain why the given information is not sufficient.

a) $f(x) - f(4)$

b) $f(x)g(x)$

c) $f(g(x))$

d) $g(f(x))$

5. (60 pts) Compute the following derivatives:

[Note: It is not necessary to simplify your answers.]

a) $\frac{d}{dx}(2x^5 - 3x^3 + x - 3x^{2/3} + 9x^{-2/3}) =$

b) $\frac{d}{dx}[(x^3 + 5x + 1) \cos(x)] =$

c) $\frac{d}{dx}[\sin(2x) - \tan(3x) + \sec(4x)]$

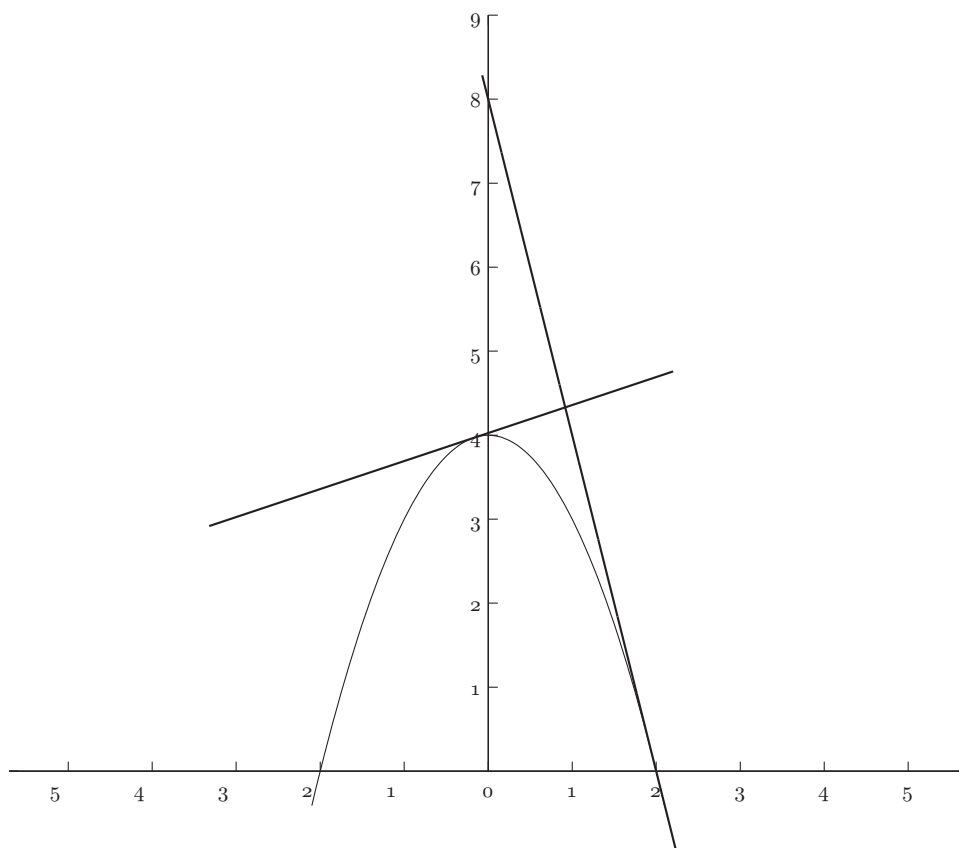
$$\text{d) } \frac{d}{dx} \left[\frac{1-3x}{1-x^2} \right] =$$

$$\text{e) } \frac{d}{dx} \cos(\sqrt{2-x^2})$$

$$\text{f) } \frac{d}{dx} \left[\frac{\tan(3)}{(1-3x)^7} \right]$$

$$\text{g) } \frac{d}{dx} [\sqrt{5-x^2} - \sqrt{5-2^2}]$$

5. (10 pts) The function $f(x) = 4 - x^2$ is graphed below.



a) Find the equation of the tangent line to the graph of $f(x)$ at $x = 2$, and draw the tangent line on the graph above.

b) Find a value x_0 so that the slope of the tangent line at $x_0 = \frac{2}{3}$. Sketch that tangent line of the graph above.

Prob	Pts
1	
2	
3	
4	
5	
6	
7	
Total	