

## MATH 234: HOMEWORK 1

DUE: FRIDAY, JUNE 24 VIA ILLINOIS COMPASS

1. Find the derivative of  $f(x) = x^{5/2}$ .
2. Find the derivative of  $f(x) = 2\sqrt{x}$  at  $x = 4$ .
3. Find the equation of the line which is tangent to the curve  $y = \sqrt{x}$  at  $x = 9$ .
4. Determine whether or not the following limit exists. If so, compute the limit.

$$\lim_{x \rightarrow -1} \frac{x^2 - 1}{x + 1}$$

5. Determine whether or not the following limit exists. If so, compute the limit.

$$\lim_{x \rightarrow 3} \frac{\sqrt{x} - 4}{x^3 + 27}$$

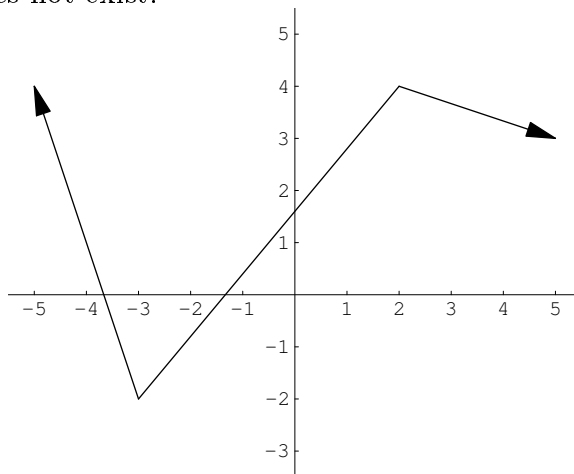
6. If  $f(x) = 1/x^{2/3}$ , then what is:

$$\lim_{h \rightarrow 0} \frac{f(-8 + h) - f(-8)}{h}$$

7. Compute the limit:

$$\lim_{x \rightarrow \infty} \frac{2x^2 + 1}{x^2 + 1}$$

8. For the graphed function below, state the  $x$ -values for which the derivative does not exist.



9. Which of the following properties are satisfied by the following function:

$$f(x) = \begin{cases} x^2 + 1 & \text{for } x < 0 \\ 1 & \text{for } x = 0 \\ 5x + 1 & \text{for } x > 0 \end{cases}$$

- (I)  $f(x)$  is continuous.
- (II)  $f(x)$  is differentiable for all  $x$ .
- (III)  $f(x)$  is differentiable at  $x = -2$ .

10. A company is planning to manufacture a new blender. After conducting extensive market surveys, the research department estimates a weekly demand of 600 blenders at a price of \$50 per blender and a weekly demand of 800 blenders at a price of \$40 per blender. Assuming the demand equation is linear, use the research department's estimates to find the revenue  $R(x)$  in terms of the demand  $x$ .