

Definition of the Derivative Homework 2  
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Let our universe be  $\mathbb{R} \times \mathbb{R}$  which is the Cartesian plane.

For all problems use the definition of the derivative to solve the following:

1. Let  $f : \mathbb{R} \rightarrow \mathbb{R}$  such that  $f(x) = x^3$ .
  - A. Find  $f'(x)$ .
  - B. Find the equation of the tangent line to  $f(x)$  at  $(2, 8)$ .
  - C. Find the equation of the normal line to  $f(x)$  at  $(2, 8)$ .
  
2. Let  $f : \mathbb{R} \rightarrow \mathbb{R}$  such that  $f(x) = 4x^2 + 7$ .
  - A. Find  $f'(x)$ .
  - B. Find the equation of the tangent line to  $f(x)$  at  $(2, 23)$ .
  
3. Let  $f : \mathbb{R} \rightarrow \mathbb{R}$  such that  $f(x) = 3x - 8$ .
  - A. Find  $f'(x)$ .
  - B. Find the equation of the tangent line to  $f(x)$  at  $(2, -2)$ .
  
4. Let  $f : (-\infty, 0) \cup (0, \infty) \rightarrow \mathbb{R}$  such that  $f(x) = \frac{3}{x^2}$ .
  - A. Find  $f'(x)$ .
  - B. Find the equation of the tangent line to  $f(x)$  at  $(2, \frac{3}{4})$ .
  - C. Find the equation of the normal line to  $f(x)$  at  $(2, \frac{3}{4})$ .
  
5. Let  $f : (-\infty, 0) \cup (0, \infty) \rightarrow \mathbb{R}$  such that  $f(x) = \frac{x+1}{x^2}$ .  
Find  $f'(x)$ .

Try this (if you can't get it, fine):

6. Let  $f : \left(-\frac{1}{2}, \infty\right) \rightarrow \mathbb{R}$  such that  $f(x) = \sqrt{2x+1}$ .  
Find  $f'(x)$ .