

Math 151  
In-class Worksheet

1. Find the derivative of the following functions *using the limit definition of the derivative*.

(a)  $f(x) = 2x^3 - x^2$

(b)  $g(x) = \sqrt{1+x^2}$

2. Find the derivatives of the following functions.

(a)  $f(x) = 4x^7 - 10x^6 + 3x^4 + x^3 - 2x^2 + 17$

(b)  $g(x) = (\sqrt[5]{x})^9$

(c)  $h(x) = x^2 \cos x$

(d)  $j(x) = x^2 \cos x \sin x$

(e)  $k(x) = \sqrt{x} \cdot \sin x - \cos x$

3. Consider the function

$$q(x) = \begin{cases} ax & \text{when } x \leq -1 \\ x^2 + 2 & \text{when } -1 < x \leq 0 \\ b - x & \text{when } x > 0 \end{cases}$$

For what values of the constants  $a$  and  $b$  is  $q(x)$  continuous everywhere?

4. (a) Does  $x^3 - 3x + 1 = 7$  have a solution in the interval  $(1, 3)$ ?  
(b) Does  $\frac{x+5}{x-2} = 0$  have a solution in the interval  $(1, 3)$ ?  
(c) Does either of the previous answers disagree with the Intermediate Value Theorem?  
(d) Show that there is a number  $x$  between 0 and 1 such that

$$\cos x = x.$$

*Hint.* Rewrite the equation above so that it looks like  $f(x) = 0$ .

5. The graphs in the righthand column represent the derivatives of the functions graphed in the lefthand column. Match each function with its derivative

