

## Derivatives

### HW Questions examples

<http://www.imathesis.com/mac2311s.html>

1. Sketch the graph of a function  $f$  for which  $f(0) = 2$ ,  $f'(0) = 0$ ,  $f'(x) < 0$  if  $x < 0$ ;  $f'(x) < 0$  if  $x > 0$ .

Note: The given function for  $x < 0$  decreases at an increasing rate; for  $x > 0$ , decreases at a decreasing rate.

2. Find the derivative of  $f(x)$ :  $f(x) = \frac{(2\sqrt{x} + 1)(x - 8)}{(x + 3)}$

3. Find all values of  $x$  at which the tangent line to the given curve has y-intercept equal to 4:  $f(x) = \frac{4x + 5}{x + 2}$ .

4. Let  $f(x) = \sin(x)$ . Find all positive integers  $n$  for which  $f^{(n)}(x) = \cos(x)$

5. Determine where is not differentiable:

a)  $f(x) = \frac{1}{1 + \cos(x)}$

b)  $f(x) = \frac{1}{\sin(x) \cdot \cos(x)}$

6. Find  $y''$  of  $y = x\sin(x) - \cos(x)$

7. Differentiate:

a)  $f(x) = \sqrt{5x - \sin^2(4x)}$

b)  $f(x) = x\cos(7x) - \sin^2(x)$ .

8. Find the equation of the tangent line to the graph at  $x = -\frac{\pi}{2}$

$$y = \sec^3\left(\frac{\pi}{2} - x\right)$$