Math 112 - Solutions to Quiz 1

Let $f(x) = 1 - 5x^2$.

1. Use the definition of the derivative (the difference quotient) to find the derivative $f'(x)$. (When you are done, you can check your answer using the power rule.)

$$\frac{f(x+h) - f(x)}{h} = \frac{\left(1 - 5(x+h)^2\right) - \left(1 - 5x^2\right)}{h} = \frac{-5(2xh + h^2)}{h} = -10x - 5h$$

   when $h = 0$ we get $f'(x) = -10x$.

2. Find the instantaneous rate of change of $f(x)$ when $x = 2$.

$$f'(2) = -20$$

3. Find the slope of the tangent line to the graph of $y = f(x)$ at the point where $x = 2$.

$$f'(2) = -20$$

4. Is the function $f(x)$ increasing or decreasing at the point where $x = 2$.
   Decreasing because $f'(2) = -20 < 0$.

5. Find the equation of the tangent line to the graph of $y = f(x)$ at the point where $x = 2$.

   Slope=$f'(2) = -20$, point $(2, f(2)) = (2, -19)$ so the equation of the line is

$$y - (-19) = -20(x - 2)$$

   or $y = -20x + 21$.