Take Home Quiz 2

Official name (printed):

1. Using the **limit definition**, find the derivative of a) $f(x) = \sqrt{x}$ and

b) $g(x) = x^2$

c) Use the answers above to find the derivative of $h(x) = 5\sqrt{x} + 3x^2$

d) Use part c) to find the equation to the tangent line to $h(x) = 5\sqrt{x} + 3x^2$ at $x = 4$.

2. When is the function not differentiable? Look for vertical tangents, discontinuites and corners. Tell which of these occurs at the point/points where the function is not differentiable.

a) $f(x) = (x^2 - 4)^{1/3}$ (Hint: graph it in your calculator)

b) $f(x) = \begin{cases} 3x^2 - 5x + 6, & x < 1 \\ 3x^2 + 2, & x \geq 1 \end{cases}$

3. Graph $f'(x) = \dfrac{9x}{(x^2+3)^2}$ in the window $[-5, 5]$ by $[-1, 1]$. This is the derivative of an unknown function $f(x)$.

a) On what intervals is $f(x)$ increasing?

b) On what intervals is $f(x)$ concave up?