MATH 160 Session #20

Given a quadratic function f(x) = ax^2 + bx + c, we have defined the tangent line to the graph of y = f(x) at the point (x, f(x)) to be the line through (x, f(x)) with slope

$$\mathbf{m_{tan}(x)} = \lim_{h\to 0} \frac{f(x+h)-f(x)}{h}$$

provided the limit exists.

Applying the definition we obtain

$$\mathbf{m_{tan}(x)} = \lim_{h\to 0} \frac{f(x+h)-f(x)}{h} = \lim_{h\to 0} \frac{[a(x+h)^2+b(x+h)+c]-[ax^2+bx+c]}{h}$$

Suppose the height (in feet) of an object at time t (in seconds) is given by s(t) = at^2 + bt + c, we have defined the instantenous velocity of the object at time t to be

$$\mathbf{v(t)} = \lim_{h\to 0} \frac{f(t+h)-f(t)}{h}$$

provided the limit exists.

So, in this case v(t) =

> **Definition of Derivative**
> **if y = f(x), the derivative of f(x), denoted by f'(x), is defined to be**
>
> $$\mathbf{f'(x)} = \lim_{h\to 0} \frac{f(x+h)-f(x)}{h}$$
>
> **if this limit exists**

If f(x) = ax^2 + bx + c, then the derivative of f(x) is f'(x) =

If y = f(x) we also denote "the derivative of f(x)" by y', $\frac{dy}{dx}$, and $\frac{d}{dx}f(x)$.

If f(x) = $3x^2$ + 6x + 5, then f'(x) =

If y = $11x^2$ – 6x + 23, then $\frac{dy}{dx}$ =