MA 16010 Lesson 6: The Derivative

Recall (slopes of linear functions).

The *slope* of a linear function $f(x) = ax + b$ is the number_____.

Meaning of slope:

Meaning of slope geometrically:

The derivative. For a function $y = f(z)$, we want to be able to:

- Find the tangent line too its graph at a given point x,
- In particular, find the slope of tangent line: This is called

_____.

How to find the derivative (using limits).

slope of the secant line =

As h gets smaller and smaller, the secant line approaches the tangent line. Therefore

Definition. The derivative of $f(x)$ at x is defined as

Example (derivative from definition step by step):
Compute the slope of the tangent line of $f(x) = 5x^2 - 2x + 8$ at general x:

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

Example:
Compute $f'(x)$ for $f(x) = \frac{3}{4x+1}$:

Example:
Find $f'(3)$ when $f(x) = x^2 + 7$:

Example:
Find the equation of the tangent line to the graph of $f(x) = \frac{3}{x^2+1}$ at $x = 2$: