Given that $f(x) = -2x^2 + 5x - \sqrt{x}$, determine the value of...

(1) $f(4)$

(2) $f(\$)$

(3) $f(9+h)$

$= -2(4)^2 + 5(4) - \sqrt{4}$

$= -32 + 20 - 2$

$= -14$

$= -2(\$)^2 + 5(\$) - \sqrt{\$}$

$f(9+h) = -2(9+h)^2 + 5(9+h) - \sqrt{9+h}$

$= -2(81 + 18h + h^2) + 45 + 5h - \sqrt{9+h}$

$= -117 - 31h - 2h^2 - \sqrt{9+h}$

$\sqrt{16+9}$

$\cancel{= 4 + 3}$

$\cancel{= 7}$

Develop the definition of a derivative

The concept of **Derivative** is at the core of Calculus and modern mathematics. The definition of the derivative can be approached in two different ways. One is geometrical (as a slope of a curve) and the other one is physical (as a rate of change).

Definition. Let $y = f(x)$ be a function. The **derivative of f** is the function whose value at x is the limit

First Principle of Calculus

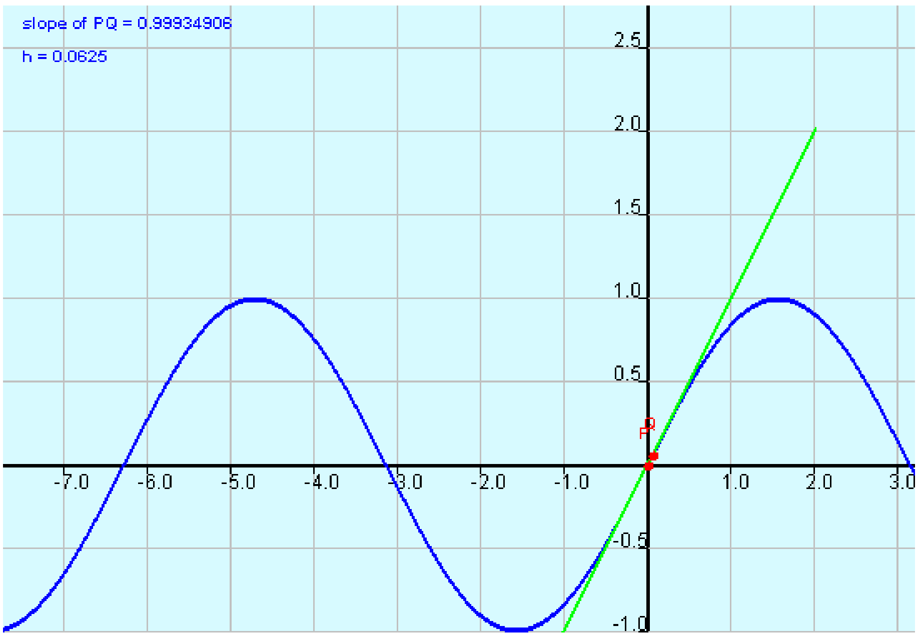
$$f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$$

Definition of a Derivative

slope of tangent

provided this limit exists.

If this limit exists for each **x** in an open interval **I**, then we say that **f is differentiable on I**.



Notation:

$$f'(x) \Leftrightarrow \frac{dy}{dx}$$ ← Leibniz Notation

"f Prime of x"

$$f''(x) \Leftrightarrow \frac{d^2y}{dx^2}$$

Examples:

Use the definition of a derivative to differentiate...

(1) $f(x) = 2x^2 - 3x + 1$

(2) $y = \sqrt{x+2}$

Example:

Determine the equation of a tangent drawn to the curve $f(x) = \dfrac{2}{1-3x}$ at $x = 1$.

Remember that the equation of a line is found by using the point-slope formula… $y - y_1 = m(x - x_1)$