1 2.7: Tangents, Velocities, and Rates of Change

We are now ready to find a formal way of computing the slope of the line tangent to the curve. Re-view the animation from 2.1 posted on my webpage. What happens as the second $x$coordinate moves closer to the given tangent line point?

Each secant line above passes through the point (1,1). If x is the x-coordinate of the second point, write an expression for the slope of the line between the two points.

Write and solve a limit problem which allows us to find the slope of the tangent line at $x = 1$.

More General: Draw any function, a tangent line, and a secant line. Label the x-coordinate of the tangent line point a and the x-coordinate of the second point x.

$m_{sec} =$

What should happen as the point $(x,\ f(x))$moves closer to the tangent-line point $(a,\ f(a))$? Write a limit which explains this mathematically:
$m_{tan} =$

Most General: Draw any function, a tangent line, and a secant line again in the space below. Label the x-coordinate of the tangent line a and let h be the horizontal distance between the x values on the secant line. (View the animation posted under today's notes for a visual understanding of this.)

$m_{sec} =$

$m_{tan} =$

The **derivative** of a function at $x = a$ is given by

Examples:

Use a limit definition to find the equation of the line tangent to the curve $f(x) = \dfrac{8}{x+2}$ at the point where $x = 0$.

On Your Own: Find the equation of the line tangent to the curve $f(x) = x^2 - 4x + 4$ at the point where $x = 3$.

$y = 2x - 5$

Secant and Tangent Vectors-an Introduction

Find a vector tangent to the curve $\mathbf{r}(t) = \sqrt{t-1}\,\mathbf{i} + (t^2 + t - 2)\mathbf{j}$ at the point $(1, 4)$. Then find parametric equations of the line tangent to the curve at this point.