

Notes 3.2 The Derivative Function

Define **differentiability** –

What does the $\lim_{h \rightarrow 0} \frac{f(x_0+h) - f(x_0)}{h}$ represent?

Is it possible for the limit of the slopes of the secant line to not exist? Give examples.

When the _____ that defines the _____ of a function does not exist, the derivative is _____. At that point, on the function, the function is _____ because the derivative is _____.

Functions are not _____ at points of discontinuity, as well.

• **Theorem:**

If a function is _____ at x_0 , then the function must be _____ at x_0 .

If the function is continuous at x_0 , does that mean its differentiable? Explain.

Example 1 Explain what is given:

(a) $f(2) = 1$

(b) $f'(2) = 7$

Example 2 Write the equation of the tangent line in Example 1.

Example 3 (a) Given that the tangent line at (1,3) has the equation $y = -2x + 5$, find $f'(1)$

(b) What is the instantaneous rate of change of y with respect to x at $x = 1$?