

Calculator Activity: Estimating the Slope of the Tangent Line

Problem: Given the function, $f(x) = \frac{\ln|x-4|}{x}$, where $x \neq 0$, write an equation for the tangent line at $x = 6$.

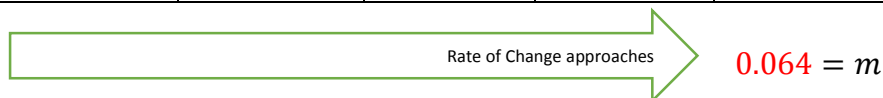
Tools Needed:

- Point-Slope Equation: $y = m(x - x_1) + y_1$ or $y = m(x - c) + f(c)$
- Slope: $\frac{y_2 - y_1}{x_2 - x_1}$ or $\frac{f(b) - f(a)}{b - a}$ and Point: $(x, f(x))$ or $(c, f(c))$

Work Needed:

- Finding Slope: Approximation using slope of the secant line.
 - Point of Interest: $(6, f(6)) = (6, .116)$ ← *find the y - value*

x	5	5.5	5.9	5.99	5.999
$f(x)$	0	0.074	0.109	0.1148	0.1154
Δy	0.116	0.042	0.0067	0.00064	0.000064
Δx	1	0.5	0.1	0.01	0.001
$\frac{\Delta y}{\Delta x}$	0.116	0.084	0.06735	0.06439	0.06411



Programming the calculator to fill in the table- (TI-Nspire)

- Setting up the equations:
 - $f_1(x) = x$ ← *will be used in $f_4(x)$ to help with calculations*
 - $f_2(x) = f(x)$ ← *this is your function so that you can produce y - values*
 - $f_3(x) = f_2(6) - f_2(x)$ ← *this is your change in y (Δy)*
 - $f_4(x) = 6 - f_1(x)$ ← *this is your change in x (Δx)*
 - $f_5(x) = \frac{f_3(x)}{f_4(x)}$ ← *this is your rate of change ($\frac{\Delta y}{\Delta x}$)*
 - Now fill in the table above

Analysis of Table:

- As x approaches (\rightarrow) 6 determine what value each of the following approach:
 - $f(x) \rightarrow .115$
 - $\Delta y \rightarrow 0$
 - $\Delta x \rightarrow 0$
 - $\frac{\Delta y}{\Delta x} \rightarrow .064 = m$

Parts: $m = .064$ and point $(6, .116) \rightarrow$ Equation of Tangent Line: $y = .064(x - 6) + .116$