Computer Lab #2

(due December 7, 2017)

Important things to know for this assignment

- Here's how you can find the derivative of an implicit equation:

  `ImplicitDerivative(x^2+y^2-y^3)` ← This finds $\frac{dy}{dx}$ for $x^2 + y^2 = y^3$

  `ImplicitDerivative(ImplicitDerivative(x^2+y^2-y^3))` ← This finds $\frac{d^2y}{dx^2}$

- Here's how you can graph an implicit equation:

  `x^2+y^2=y^3` ← This graphs $x^2 + y^2 = y^3$

- Here's how you can graph approximating rectangles:

  `f(x)=x^2` ← This graphs $f(x) = x^2$

  `RectangleSum(f,0,2,4,0)` ← This shows 4 rectangles under f on $[0,2]$ using left endpoints

  `RectangleSum(f,0,2,4,0.5)` ← This shows 4 rectangles under f on $[0,2]$ using midpoints

  `RectangleSum(f,0,2,4,1)` ← This shows 4 rectangles under f on $[0,2]$ using right endpoints

- Here's how you can evaluate an integral:

  `Integral(f,0,2)` ← This evaluates $\int_0^2 f(x)\,dx$ and shows the "area under the curve"

See Lab #1 for more directions.

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1. Consider the implicit equation $x^3 + y^3 = 3xy$.
   a. Use implicit differentiation to find $\frac{dy}{dx}$ by hand.
   b. Now use GeoGebra to find $\frac{dy}{dx}$.
   c. Find the equation of the tangent line at $\left(\frac{3}{2}, \frac{3}{2}\right)$ by hand.
   d. Use GeoGebra to graph the curve in blue and the tangent line that you found for part (c) in red on a single coordinate system with $x = -5$ to $x = 5$, and $y = -5$ to $y = 5$.
   e. Now use GeoGebra to find $\frac{d^2y}{dx^2}$.

2. Consider the function $f(x) = \frac{1}{30}x^2 + \sin x - 1$.
   a. Use GeoGebra to graph $f(x)$. Use rectangles to approximate the integral $\int_0^{10} f(x)\,dx$ given each of the following conditions. Be sure to graph the rectangles in each case.
      i. 10 rectangles using right endpoints
      ii. 100 rectangles using right endpoints
      iii. 200 rectangles using right endpoints
      iv. 10 rectangles using midpoints
      v. 100 rectangles using midpoints
   b. Evaluate $\int_0^{10} f(x)\,dx$ by hand.
   c. Now use GeoGebra to evaluate $\int_0^{10} f(x)\,dx$.