Examples 2.5 – Linear Approximation

1. Use Leibniz notation to find the first three derivatives of $y = 11x^2 - 4x + 7$.

   Solution:

2. Use differential operator notation to find the slope of the graph of $f(t) = -t^3 + 2t$ at $t = 1$.

   Solution:

3. Find an equation for the tangent line to $y = \frac{1}{2}x^2 + 3$ at $x = 1$. Use your calculator to view the function and the tangent line on the same screen. (Use the window $[-2, 4] \times [0, 8]$.)

   Solution:

4. Let $y = 3x^2$. Find Δy and dy when $x = 1$ and $\Delta x = 0.1$.

   Solution:

5. The side length of a cube is measured as $x = 25$ cm, with possible error in measurement $\Delta x = \pm 0.01$ cm. The measurement is then used to calculate the volume $V = x^3$. Find the propagated and relative errors in the volume calculation.

   Solution: