SECTION 3.10: LINEARIZATION & DIFFERENTIALS

1. Use the linear approximation of $f(x) = \sqrt{x}$ at $x = 4$ to approxmiate $\sqrt{4.1}$ and compare your result to its approximation computed by your calculator.

2. Use the linear approximation to approximate the cosine of $29^\circ = \frac{29}{30}\frac{\pi}{6}$ radians.

3. Find the linear approximation of $f(x) = \ln(x)$ at $a = 1$ and use it to approxmate $\ln(0.5)$ and $\ln(0.9)$. Compare your approximation with your calculator's. Sketch both the curve $y = \ln(x)$ and $y = L(x)$ and label the points $A = (0.5, \ln(0.5))$ and $B = (0.5, L(0.5))$

4. A tree is growing and the radius of its trunk in centemeters is $r(t) = 2\sqrt{t}$ where t is measured in years. Use the differential to estimate the change in radius of the tree from 4 years to 4 years and one month.

5. A coat of paint of thinkness 0.05cm is being added to a hemispherical dome of radius 25m. Estimate the volume of paint needed to accomplish this task. [Challenge: will this be an underestimate or an overestimate? Thinking geometrically or thinking algebraically will both give you the same answer.]

6. The radius of a disc is 24cm with an error of ± 0.5cm. Estimate the error in the area of the disc as an absolute and as a relative error.