1. Use the linear approximation of $f(x) = \sqrt{x}$ at x = 4 to approximate $\sqrt{4.1}$ 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 approximate $\ln(0.5)$ 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 centimeters 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 thickness 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 ± 0.5 cm. Estimate the error in the area of the disc as an absolute and as a relative error.