Math 152 Lab 1

Use Python to solve each problem.

1. The double-angle tangent formula is given by

$$\tan(2\theta) = \frac{2\tan(\theta)}{1 - \tan^2(\theta)}$$

   Define a variable θ and verify this identity is true when $\theta = \frac{\pi}{7}$ and when $\theta = 110°$

   (NOTE: θ may be defined as the numerical values OR symbolically as discussed in the Overview. Convert to radians first if necessary.

   ALSO NOTE: you should either **simplify** your left and right-hand sides or, if that does not work, use the **evalf** command to convert your answers to decimals.)

2. An antiderivative of a function f is given by

$$\int f(ax)\,dx = \frac{\sin(ax)}{a^2} - \frac{x\cos(ax)}{a}$$

   a) Find $\int f(0.6x)\,dx$.

   b) Use the Fundamental Theorem of Calculus to find $\int_{\pi/3}^{3\pi/2} f(0.6x)\,dx$. Again use **evalf** to give a decimal approximation.

3. A sphere has a radius of 24cm.

   a) Find the volume ($V = \frac{4}{3}\pi r^3$) and surface area ($S = 4\pi r^2$) of the sphere in **cubic inches** and **square inches** respectively.

   b) Suppose the box in the Overview was cut from an $8\frac{1}{2} \times 11$ inch sheet of cardboard. It would then have dimensions $x \times (8.5 - 2x) \times (11 - 2x)$. Find the value(s) of x for which the volume of this box is 1% of the volume of the sphere.

   c) Find the value(s) of x for which the surface area of the box is 5% of the surface area of the sphere. (REMEMBER: the way the box was constructed, there is no top!)