1. Solve the initial value problem:

$$y' = x\sqrt{\frac{1-y^2}{1-x^2}}, \quad y(0) = 0.$$

2. Twenty percent of the candy in your Valentine's day gift disappears after one hour. If the candy is disappearing exponentially, determine:
   (a) the percent of candy after three hours, and
   (b) the amount of time it will take until you have less than one percent of your candy left.

3. Use integration by parts to evaluate the integrals.

(a) $\int x^2 \sin x \, dx$

(b) $\int \dfrac{\ln x}{x^2} \, dx$

4. Find the area of the region bounded by $y = \ln x$, $y = 0$, and $x = e$.