Review For Exam II   (March 26, 2016)

1. Compute the arc length of the curve $y = \ln(\cos x)$ between $x = 0$ and $x = \frac{\pi}{4}$.

2. Compute the surface area of the surface generated by rotating the curve $y = x^2$ around the x-axis between $x = 0$ and $x = 1$.

3. The force, F, required to compress a certain spring x centimeters from its natural length is given by the formula $F(x) = 3x$ N. Find the work required to compress the spring 4 cm from its natural length.

4. A one meter metal bar is not uniform in composition. Its density, ρ, is given by the formula $\rho(x) = x^2$ kg/m where $0 \le x \le 1$ and x is measured in m.
   a) Find the mass of the bar.
   b) Find the center of mass of the bar.

5. Integrate.
   a) $\int \frac{1+\sin x}{\cos x}\, dx$
   b) $\int \frac{\ln x^2}{x}\, dx$
   c) $\int x^2 e^x\, dx$
   d) $\int e^x \sin x\, dx$
   e) $\int \sin^4 x \cos^3 x\, dx$
   f) $\int \sin^4 x\, dx$
   g) $\int \frac{x^5 + x + 1}{x^4 - 1}\, dx$
   h) Do another 30 or 40 integrals.

6. Compute the following limits.
   a) $\lim_{x \to \infty} \frac{\ln x}{\sqrt{x}}$
   b) $\lim_{x \to 0+} (1 + x)^{1/x}$
   c) $\lim_{x \to 0+} \left(\frac{1}{\sqrt{x^2+1}} - \frac{1}{x} \right)$