

Homework 7  
(due Friday, November 14)

1. Show that  $\lim_{x \rightarrow \infty} x e^{-x} = 0$ .
2. Show that  $\lim_{q \rightarrow \infty} x^2 e^{-x} = 0$ .
3. Show that  $\lim_{x \rightarrow 0} \frac{\sin(x)}{x} = 1$ .
4. Compute  $\lim_{x \rightarrow 1} \frac{1-x+\ln(x)}{1+\cos(\pi x)}$
5. Compute  $\lim_{y \rightarrow 0} \frac{y^2}{2^y}$
6. Do problem 16 from section 4.7
7. The radius of a sphere is increasing at a rate of 2 feet per second. How fast is the volume changing when the radius is 20 feet?
8. The radius of a cylinder is increasing at a rate of 3 inches per second and its height is decreasing at a rate of 1.5 inches per second. How fast is the surface area of the sphere changing when the radius is 10 inches and the height is 100 inches?
9. Do problem 44 from section 4.6
10. If two resistors (with resistances  $R_1$  and  $R_2$ ) are connected in parallel, then the resulting resistance ( $R$ ) satisfies

$$\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2}.$$

Suppose that  $R_1$  is held constant at  $10 \Omega$  ( $\Omega = \text{ohm}$ ). Find the rate at which  $R$  is changing given that  $R_2$  is increasing at a rate of  $2 \frac{\Omega}{\text{sec}}$  when  $R_2 = 20 \Omega$ .