1. (8 pts) Use the definition of the derivative, i.e., the limit process, to find the derivative of the function \( f(x) = \sqrt{x + 3} \).

2. (48 pts) Use the rules of differentiation to find the derivatives of the following functions.

   (a) \( f(x) = 5x^3 - 10x^2 + x - 20 \)
   
   (b) \( f(x) = \frac{1}{\sqrt{x}} \)
   
   (c) \( f(x) = (x^2 + 1) \sin x \)
   
   (d) \( f(x) = \frac{x^2 + 2x + 2}{x + 1} \)
   
   (e) \( f(x) = \tan 5x \)
   
   (f) \( f(x) = \sqrt{5x^3 + 1} \)

3. (6 pts) Find the first three derivatives \( f'(x) \), \( f''(x) \), and \( f'''(x) \) of the function \( f(x) = \sin 4x \).

4. (10 pts) Suppose that the position in feet of an object at time \( t \) sec is given by the function \( s(t) = -t^3 + 6t^2 \) for \( 0 \leq t \leq 4 \).

   (a) Find a function for the velocity of the object as a function of \( t \).
   
   (b) Find a function for the acceleration of the object as a function of \( t \).
   
   (c) When will the object have a speed of 9 ft/sec?
   
   (d) What will the object’s acceleration be when its velocity is 9 ft/sec?

5. (8 pts) Find the equation of the line tangent to the curve \( x^3 + y^3 = 9 \) at the point \( (1, 3) \).

6. (10 pts) The area of an annular ring with inner radius \( r \) and outer radius \( R \) is given by \( A = \pi(R^2 - r^2) \). (See the diagram below.) If both radii are increasing at a rate of 5 in/sec, what is the rate of change of the area when \( R = 10 \) and \( r = 8 \)?

7. (10 pts) Find the extreme values of the function \( f(x) = x^2 + \frac{16}{x} \) on the interval \([1, 4]\). Use the method discussed in class to find and list all candidates for the extreme values and then identify the ones that are the extremes.