1. Let \( f(x) = x^2 \).
   
   (a) Compute \( f'(3) \)
   
   (b) What is the limit definition of \( f'(3) \)?
   
   (c) What does \( f'(3) \) mean geometrically?

2. Find
   
   (a) \( \int_{1/2}^{\frac{1}{x}} dx \)
   
   (b) \( \int_0^\infty xe^{-x^2} \) dx

3. On what intervals is \( f(x) = 2x^3 + 3x^2 - 12x \) increasing? Also, find the absolute maximum of \( f \) on the interval \( 0 \leq x \leq 3 \).

4. State two versions of the Fundamental Theorem of Calculus.

5. Let \( f(x) = \int_0^x \sin(t^3) \) dt. What is \( f'(10) \)?

6. Use two triangles and a circle to work out: \( \cos \pi/6, \sin \pi, \tan \pi/4, \cot \pi/3 \).

7. Compute the equation of the tangent line to \( y = \cos(x^2) \) at \( x = \pi/3 \).

8. Graph (a) \( 2x + 5y = 1 \), (b) \( y = x^2 - 2x + 3 \), (c) \( y^2 - 9x^2 = 4 \), (d) \( 16y^2 + 9x^2 = 1 \). Do not use a table of values. Instead use graphing techniques you learned in College Algebra and Calculus I and II.

9. (a) Let \( h(x) = \sin(g(x)) \) where \( g(0) = 2 \) and \( g'(0) = 3 \). What is \( h'(0) \)?
   
   (b) More generally, suppose that \( h(x) = f(g(x)) \) and that \( g(0) = 2, f(0) = 4, g'(0) = 3, f'(0) = 4, g(2) = 6, f(2) = -3, g'(2) = -5, f'(2) = 9 \). Find \( h'(0) \).

10. Find the area bounded by the curves \( y = x/2 \) and \( y = \sqrt{x} \).

11. In this problem, we take a curve in the \( y-z \) plane and rotate it about the \( z \)-axis to obtain a surface. Sketch the resulting surfaces in the case that the curve is (a) The circle centered at the origin radius 1, (b) The circle centered at \( (y, z) = (2, 0) \) radius 1, (c) The line segment joining \( (1, 2) \) to \( (3, 4) \).