0. (1 point) Carefully read and complete the instructions at the top of this exam sheet and any additional instructions written on the chalkboard during the exam.

1. (3 points) Compute \( \frac{dy}{dx} \) if \( y = \tan(2x) \).

2. Let \( f(x) = x^3 \).
   (a) (5 points) Find the linearization of the function \( f \) at the point \( a = 2 \).
   (b) (1 point) Use part (a) to estimate the value of \( 2.1^3 \).
   (c) (2 points) Write an expression for the percentage error for your approximation in (b).
      (You do not need to compute it.)

3. Let \( g(x) = x^2e^{-x} \). The second derivative of \( g \) is \( g''(x) = (2 - x^2)e^{-x} \).
   (a) (4 points) Compute \( g'(x) \), the first derivative of \( g \).
   (b) (4 points) Over which interval or intervals is \( g \) decreasing?
   (c) (4 points) Over which interval or intervals is \( g \) concave up?

4. (7 points) Define a function \( h \) according to the following rule:
   \[
   h(x) = \begin{cases} 
   \frac{1 - \cos(3x)}{x^2} & \text{if } x \neq 0, \\
   3/2 & \text{if } x = 0. 
   \end{cases}
   \]
   Is \( h \) continuous at \( x = 0 \)? Justify your answer.

5. (9 points) Use implicit differentiation to find the slope of the tangent line at \( (1,1) \) to the curve
   \[
   \frac{\pi}{4} + \ln(2 - x^2) = \arctan(y^3).
   \]

(This exam is worth 40 points.)