EXAM IV

CALCULATORS are NOT allowed. Read the problems carefully.

1. (12 points each) Evaluate each of the following integrals:
   
   (a) \( \int \frac{e^{2x}}{1 + e^x} \, dx \)
   
   (b) \( \int_0^1 x e^{-x^2} \, dx \)
   
   (c) \( \int \cot x (1 + \sin x) \, dx \)
   
   (d) \( \int_{-2}^2 |1 + x^3| \, dx \)

2. (12 points) Write down the Riemann sum for \( f(x) = 4x^2 \) on the interval \([1, 7]\) by subdividing the interval into \( n \) equal subintervals and taking \( x_i^* = \) the right end-point of the \( i^{th} \) subinterval. FIND the limit of this sum as \( n \to \infty \).

3. (8 points) Show that \( \int_0^{\pi/6} \frac{\cos x}{1 + x^2} \, dx \leq 1/2 \).

4. (8 points) Find the derivative of the function \( f(x) = \int_{\cos x}^x e^{t^2} \, dt \).

5. (12 points) Set up an integral, but do not evaluate, to find the volume of the solid obtained by revolving the region bounded by \( y = x \) and \( y = \sqrt{x} \) about \( x = 2 \).

6. (12 points) Set up an integral, but do not evaluate, to find the volume of the solid obtained by revolving the region bounded by \( y = x^2 \) and \( x = y^2 \) about \( y = -1 \) by using the shell method.