Sample Questions for Final Exam

1. Calculate the general antiderivatives of the following functions.
   (a) \( f(x) = 6x^2(x^3 + 7)^2 \)
   (b) \( g(t) = 3e^{2t} \)
   (c) \( h(s) = \frac{2s}{4s^2 - 3} \)

2. Calculate the following definite integrals.
   (a) \( \int_{9}^{10} \frac{x}{x-8} \, dx \)
   (b) \( \int_{1}^{e} \ln x \, dx \)

3. Find \( \int_{0}^{3} 2x + 4 \, dx \) by graphing the functions, shading an appropriate region and interpreting the integral as the shaded area. Use geometry to determine the area.

4. Find the area bounded between the curves \( y = x^2 - 2x \) and \( y = 2 - x \).

5. The production of a certain industry is modeled by the following Cobb-Douglas production function:
   \[
P(L, C) = 0.02506L^{0.0481}C^{0.9519} \text{ billion cases.}
   \]
   Here, \( L \) represents spending on labor in millions of dollars, and \( C \) represents spending on capital in millions of dollars.
   (a) Determine the quantity of production when the industry spends $500 million on capital and $150 million on labor.
   (b) Use derivatives to estimate how much the production would change if the industry increased it’s spending on labor by $1 million.
   (c) Use derivatives to estimate how much the production would change if the industry increased it’s spending on capital by $1 million.

Also review the sample questions for Exam #1 and Exam #2.