Math 234 Practice Problems for Exam 3

1. Simplify the following expressions.
   (a) $\log 2 + \log 5$ (b) $\ln e^2$ (c) $e^{\ln 3}$ (d) $(\log_2 3)(\log_3 2)$

2. Find the derivatives of
   (a) $f(x) = e^{x+1/x}$ (b) $f(x) = \log_2(x^3 + x)$

3. Solve the following equations for x.
   (a) $e^x = 2$ (b) $\log_4 x = 2$ (c) $\log_2 x = \log_3 x$ (d) $\ln x^2 = 4$

4. Compute
   (a) $\int 4^x \, dx$ (b) $\int x + \ln 2 \, dx$ (c) $\int \dfrac{2x \ln(x^2+1)}{x^2+1} \, dx$

5. Use logarithmic differentiation to compute the derivative of $y = \dfrac{x^2 e^x}{(x+1)^3}$

6. Compute $\displaystyle\int_0^4 \frac{x}{x+1} \, dx, \quad \int_0^2 x e^{x^2} \, dx$

7. Compute the area of the region bouned by $y = e^x$, $y = e^{-x}$ and $x = \ln 2$.

8. Compute the average of the function $y = \sqrt{x}$ over $[1, 9]$.

9. (Marginal Cost) A manufacturer estimates that the marginal cost of producing q units of a certain commodity is $C'(q) = 3q^2 + 10q + 50$ dollars per unit. If the cost of producing 10 units is \$5,000, what is the cost of producing 30 units?

10. (Compound Interest)
    (a) Suppose \$5,000 dollars are invested at an annual rate of 12%. What is the balance after 5 years if the interest is compounded monthly.
    (b) How quickly will money double if it is invested at an annual interest rate of 20% compounded continuously?