Review problems

Exponential and Logarithmic Functions

1. Evaluate each expression:

   a) $ln\ e^7$

   b) $e^{ln\ 6}$

   c) $e^{3\ ln\ 2}$

   d) $ln\ 1$

2. Solve each equation:

   a) $6 = 2 + 3e^{-2x}$

   b) $log_3 x = 2$

   c) $5^{x+4} = 25^{7x-1}$

   d) $3ln\ x + 2 = 6 - ln\ e$

   e) $4^x = e^2$

   f) $log_7\ 60 = x$ (Use the Change of Base Rule)

3. For an investment with:

   P = $4,000 Principal r = 8% Annual Interest Rate (APR) t = 4 years Time Invested

   Find the balance B(t) for the following types of compounding:

   a) compounded quarterly

   b) compounded annually

   c) compounded continuously

4. Find the APY (effective interest rate) for each investment:

   a) APR (nominal interest rate) = 8%, compounded quarterly

   b) APR = 8%, compounded continuously

5. How long would it take a $4,000 investment to triple if compounded continuously at 8%?

6. What sum of money needs to be invested today in order to have $12,000 after 6 years compounded monthly at 6%?

7. Radium decays exponentially. Suppose a 20 gram sample decays to 12 grams in 4 years. How long will it take 20 grams to reduce to 3 grams?

8. A population of fruit flies grows exponentially. If 3,000 flies were present initially and 5,000 were present 2 days later, how long would it take for the initial population to double?

9. A Ford pickup truck decreases in value exponentially. The truck was purchased brand new for $45,000 and was worth $20,000 after 2 years. How much will the truck be worth when it is 4 years old?

10. Differentiate each of the following:

a) $6e^{2x+3}$

b) e^{3x^2}

c) $ln\ 6x$

d) $4xe^{-5x}$

e) $(ln\ x)(e^x)$

f) $(ln\ x)/(x^2)$

g) $(1 + 5e^{6x})^{-1/2}$

11. Find the equation of the tangent line to $y = ln\ (x - 5)$ at $x = 6$

Sections 5.1 – 5.2 Integration

12. Evaluate each integral:

a) $\int 20x^4 dx$

b) $\int (16\sqrt[3]{x}\, dx$

c) $\int (4 - y) dy$

d) $\int (3x - 2)^2 dx$

e) $\int \frac{6w^3+4w}{2w}\, dw$

f) $\int 10e^{10x} dx$

g) $\int \frac{8}{x} dx$

h) $\int P dx$

13. The marginal cost derived from producing "q" units of a certain commodity is $C'(q) = 3q^2 - 60q + 400$ [dollars per unit]. The total cost of producing the first 2 units is \$900. What is the total cost of producing the first 5 units?

14. Use "u" substitution to evaluate each integral:

a) $\int 3x^2(x^3 - 1)^{10}\, dx$

b) $\int xe^{3-4x^2} dx$

c) $\int \frac{3}{3x+1} dx$