HOMEWORK 8 - MATH 160

DUE DATE: Tuesday, October 27

INSTRUCTOR: George Voutsadakis

Read each problem **very carefully** before starting to solve it. Two out of the ten problems will be chosen at random and graded for a total of 20 points. It is necessary to show **all** your work. Correct answers without explanations are worth 0 points.

GOOD LUCK!!

1. A rectangular box is to have a square base and a volume of 20 cubic feet. If the material for the base costs 30 cents per square foot, the material for the sides costs 10 cents per square foot and the material for the top costs 20 cents per square foot, determine the dimensions of the box that can be constructed at minimum cost.

2. A book designer has decided that the pages of a book should have 1 inch margins at the top and bottom and 1/2 inch margins on the sides. She further stipulated that each page should have an area of 50 square inches. determine the page dimensions that will result in the maximum printed area on the page.

3. An apple orchard has an average yield of 36 bushels of apples per tree if the tree density is 22 trees per acre. For each unit increase in tree density, the yield decreases by 2 bushels per tree. How many acres should be planted in order to maximize the yield?

4. Evaluate or simplify the following expressions:
   (a) $\frac{(2^{-4})(2^6)}{2^{-1}}$
   (b) $(\frac{8}{27})^{-1/3}(\frac{81}{256})^{-1/4}$
   (c) $x^{-3/5}x^{8/3}$
   (d) $\frac{(a^m a^{-n})^{-2}}{(a^{m+n})^2}$

5. On the same coordinate axes sketch the graphs of $f(x) = 4^x$ and $g(x) = 5^{-x}$.

6. Solve the following equations for x:
   (a) $3^{x-x^2} = \frac{1}{9^x}$
   (b) $2^{2x} - 4 \cdot 2^x + 4 = 0$

7. If $f(x) = Axe^{-kx}$, find $f(3)$ if $f(1) = 5$ and $f(2) = 7$.

8. Express each equation in logarithmic form

$$(a) \quad 3^5 = 243 \qquad (b) \quad (\frac{1}{2})^{-4} = 16 \qquad (c) \quad 16^{-1/4} = 0.5$$

9. Write as a single logarithm or expand and simplify, as appropriate:
   (a) $\ln 2 + \frac{1}{2}\ln(x+1) - 2\ln(1+\sqrt{x})$
   (b) $\log \frac{\sqrt{x+1}}{x^2+1}$
   (c) $\ln \frac{x^2}{\sqrt{x}(1+x)^2}$

10. Use logarithms to solve the following equations for t:
    (a) $12 - e^{0.04t} = 3$
    (b) $\frac{200}{1+3e^{-0.3t}} = 100$