# Math 205 Exam I

7:15pm–8:15pm, Thursday, September 15, 2005

**Instructor:**_____ **Class Time:**_____ **Name:**_____

No books or notes are allowed. Please read the problems carefully and do **all** you are asked to do. **You must show your work!** You can use the back page as a scratch paper. Do the problems at the space provided.

| Total/100 | #1 | #2 | #3 | #4 | #5 | #6 | #7 | #8 |
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**1(total points: 13).** An appliance company that makes a brand of washing machines has monthly fixed costs of $\$600,000$ and variable costs of $\$150$ per washer. The company sells the washers for $\$225$ each.

(a)**(7 points).** Find a formula for the monthly profit as a function of $q$, the number of washers produced monthly.

(b)**(6 points).** Find the break–even point and use one sentence to explain the economic significance of your result.

**2(12 points).** A $\$23,000$ new bought car depreciates linearly down to a value of $\$10,000$ in 10 years.

(a)**(7 points).** Find a formula for its value $V$ as a function of time $t$, number of years since its initial purchase.

(b)**(5 points).** How much is the car worth three years after its purchase?

**3(total points: 13).** The demand and supply curves for a certain product are given in terms of price, $p$ dollars per unit, by

$$D(p) = 2500 - 20p \text{ and } S(p) = 10p - 500.$$

(a)**(5 points).** Find the equilibrium price and quantity.

(b)**(5 points).** If a specific tax of \$6 per unit is imposed on the producers, find the new equilibrium price and quantity.

(c)**(3 points).** How much of the \$6 tax is payed by consumers and how much by the producers?

**4(total points: 12).** In each of the items (a)–(d), determine if the function is a power function. If it is a power function, write it in the form $y = kx^p$ and give the values of the coefficient $k$ and the exponent $p$.

(a)**(3 points).** $y = -\frac{1}{\sqrt{x}}$.

(b)**(3 points).** $y = 2(3^x)$.

(c)**(3 points).** $y = 5 + x^2$.

(d)**(3 points).** $y = (x^3)^2$.

**5(total points: 12).** Solve the following equation for $t$. (You should use your calculator to find a decimal approximation.)

$$59(5^t) = 7^t.$$

**6(total points: 13).** According to Johnson and Matchett, in tallgrass prairies in Kansas the new root growth $y$ measured in germs per square meter as a function of $x$, the depth below the surface, measured in centimeters, can be approximated by $y = 192e^{-0.34x}$. Estimate the soil depth for which the root growth is one half of the amount at the surface.

**7(total points: 12).** The functions $f$ and $g$ are given by the following graphs.

(a)**(6 points).** Estimate $f(g(1))$.

(b)**(6 points).** Estimate $g(f(2))$.

**8(total points: 13).** Assume that accounts A and B both have annual interest rates (nominal rates) of 6%.

(a)**(6 points).** If the interest of account A is compounded quarterly, find its effective annual yield.

(b)**(7 points).** If the interest of the account B is compounded continuously and the account holder needs a balance of $40,000$ dollars in 30 years after its opening. How much initial investment in the account is needed?