Mathematics 133 – Intensive Calculus for Science 1
Precalculus Review Problems
August 28, 2001

The following problems will not be collected or graded. They are similar to questions on the first diagnostic quiz to be given in class on Friday, August 31.

1. Find all values of x that satisfy the given inequality or inequalities:

   a) $-4x \geq 20$
   b) $x+1>4$, or $x+2<-1$
   c) $x+3>1$ and $x-2<1$

2.

   a) Rewrite using positive exponents only: $\frac{x^{-1/3}}{x^{1/2}}$
   b) Simplify: $(x^2y^{-3})(x^{-5}y^3)$
   c) Simplify: $\left(\frac{x^3}{-27y^{-6}}\right)^{-2/3}$
   d) Simplify: $\left(\frac{x^{-3}}{y^{-2}}\right)^2\left(\frac{y}{x}\right)^4$

3. A salesperson's monthly commission is 15% on all sales over \$12000. If the goal is to make a commission of at least \$3000 per month, what monthly sales figure should he or she attain?

4. The diameter x in inches of a batch of ball bearings manufactured by PAR Mfg. satisfies the inequality $|x-.1| \leq .001$. What are the largest and smallest diameters a ball bearing in the batch can have?

5. Perform the indicated operations and simplify:

   a) $x-(2x-(-x-(1-x)))$
   b) $2(t+\sqrt{t})^2-2t^2$
   c) $(2x^2-1)(x)-x^2(x+2)$
   d) $5x^2(3x+1)^4(6x)+(3x+1)^5(2x)$

6. Factor out the greatest common factor:

   a) $7a^4-42a^2b^2+49a^3b$
   b) $xe^{-2x}-x^3e^{-x}$

7. Factor:

   a. $6ac+3bc-4ad-2bd$
   b. $3x^2-6x-24$
   c. $9x^2-16y^4$

8. Solve for x:

a. $x^2 + x - 12 = 0$
b. $4x^3 + 2x^2 - 2x = 0$
c. $8x^2 - 8x - 3 = 0$

9. Simplify:

a.
$$\frac{2a^2 - 2b^2}{b - a} \cdot \frac{4a + 4b}{a^2 + 2ab + b^2}$$

b.
$$\frac{58}{3(3 + t^2)} + \frac{1}{3}$$

c.
$$\frac{2x}{2x - 1} - \frac{3x}{2x + 5}$$

d.
$$\frac{1 + \frac{1}{x}}{1 - \frac{1}{x^2}}$$

e.
$$\frac{2x(x+1)^{-1/2} - (x+1)^{1/2}}{x^2}$$

10.

a. On a set of coordinate axes, plot the points $P = (1, 3)$ and $Q = (4, 7)$. Determine the distance $d(P, Q)$ between them.
b. What is the Cartesian equation of the circle with center $(h, k) = (4, 2)$ and radius $r = 6$.
c. The equation $x^2 + y^2 + x - 6y = 0$ defines a circle in the plane. Find its center and radius.
d. Do the points $(3, 4), (-3, 7), (-6, 1), (0, -2)$ form the vertices of a square in the plane? Why or why not?