Mathematics 135 – Calculus 1
Precalculus Review Problems
August, 2016

The following questions indicate the sorts of topics and questions that will appear on the precalculus diagnostic quiz that will be given at the start of class on Friday, September 2.

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: $\left(\frac{x^{-3}}{y^{-2}}\right)^2 \left(\frac{y}{x}\right)^4$

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 should his/her monthly sales be?

4. Factor:

   a) $7a^4 - 42a^2b^2 + 49a^3b$
   b) $xe^{-2x} - x^3e^{-x}$
   c) $6ac + 3bc - 4ad - 2bd$
   d) $3x^2 - 6x - 24$
   e) $9x^2 - 16y^4$

5. Solve for x:

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

6. 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)

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

7. Let $f(x) = (x+1)^3$ and $g(x) = x^2 - 1$.
   a) What is the function $f(g(x))$?
   b) What is the function $g(f(x))$?
   c) What is the function $f(x)g(x)$?
   d) What is the domain of the function $\frac{f(x)}{g(x)}$?

8.
   a) Let $f(x) = x^3 - 2x^2 + 3$. Simplify as far as possible: $\frac{f(a+h)-f(a)}{h}$.
   b) Same question for $f(x) = \frac{1}{\sqrt{x}}$.

9. Express in terms of the sine and cosine functions and simplify:

$$g(x) = \csc^2(x) + \sec^2(x)$$