Preliminary Review Problems
Math 130 *Kovitz*

1. (a) Divide 4 by $-1/4$.

   (b) Simplify $8 \div \frac{1}{3} + \frac{2}{3}$.

2. Subtract. $(5x^2 - 8x + 1) - (8x^2 - 2x + 6)$

3. Multiply. $-3a^2(a^2 - 4a + 5)$

4. Multiply:

   (a) $(6x - 1)(2x + 5)$.

   (b) $(2a - 7)^2 - 30$.

   (c) $3(x - 1/4)^2 + 2$.

5. Divide. $\dfrac{72x^3 - 32x^2 + 8x}{8x}$

6. Factor.

   (a) $3x^2 - 75$

   (b) $9x^2 - 30x + 25$

   (c) $x^2 + x - 12$

   (d) $12x^2 - 17x - 40$

7. True or false?

   (a) $(-2)(-3) = -(2)(3)$

   (b) $\dfrac{-5}{-6} = -\left(\dfrac{5}{6}\right)$

8. (a) Simplify this expression so that it stays in factored form without a leading minus sign.
   $$-\left[(2 - \sqrt{2})(3 - \sqrt{3})\right]$$

   (b) Solve for x.
   $$-x = \frac{\sqrt{6} - \sqrt{3}}{\sqrt{2} - \sqrt{5}}.$$

9. Simplify.

   (a) $\dfrac{ab - b^2}{5ab - 5a^2}$

   (b) $\dfrac{x - 1}{x^2 + 4} \div \dfrac{x^2 - 1}{x + 2} + \dfrac{1}{x + 1}$

   (c) $\dfrac{2x + y}{x + 2y} + \dfrac{x + 5y}{x + 2y}$

   (d) $\dfrac{x}{x - 3} - \dfrac{x - 7}{x - 1} - \dfrac{1}{2}$

   (e) $\dfrac{a^2 - 5}{a - b} + \dfrac{b^2 - 5}{b - a}$

   (f) $1 + \dfrac{1}{\frac{1}{x} + \frac{1}{3}}$

   (g) $\dfrac{2}{3 - x} - \dfrac{5}{3 + x}$

10. Solve for x.

    (a) $\dfrac{2}{7} + \dfrac{6}{x-1} = \dfrac{x}{21}$.

    (b) $\dfrac{20}{x} + \dfrac{15}{x-7} = 7$.

    (c) $\dfrac{1}{\frac{1}{x} + \frac{1}{3}} = 7$.

    (d) $\dfrac{1}{\frac{1}{x} + \frac{1}{3}} = \dfrac{1}{7}$.

        Is this answer just the reciprocal of the previous answer?

11. Solve for x. $2x + 5(x - 7) = 59 - (3x + 1)$.

12. Solve for d. $A = \frac{1}{2}h(c - d)$.

13. Solve for x. (real number solutions only)

    (a) $2x^2 - 14x = 0$

    (b) $x^2 - 22x = 11$

    (c) $x^2 - 5x - 84 = 0$

    (d) $x^2 + x - 1 = 0$

    (e) $x^2 - x + 1 = 0$

    (f) $5x^2 - x - 4 = 0$

    (g) $3x^2 - x + \dfrac{1}{12} = 0$.

    (h) $3x^2 - x + \dfrac{1}{16} = 0$.

    (i) $\left(x - \frac{1}{8}\right)^2 = \left(2\frac{1}{8}\right)^2$.

        (here $2\frac{1}{8}$ is a mixed number and could also be written as 2.125 or $\frac{17}{8}$.)

    (j) $(x - 4139)^2 = 161^2$.

14. Simplify, if you can: $\sqrt{a^2 + b^2}$.

15. For this problem, assume that $|a| \le 1$, making $1 - a^2$ nonnegative.

Find an alternate expression that is equivalent to $\sqrt{1 - a^2}$.

Which is simpler: the original expression, $\sqrt{1 - a^2}$, or your answer?

Answer: it depends.

Try letting $a = 0.5376$. Which is easier for you to evaluate on a calculator? Find the result with 0.5376 substituted for a.

Try letting $a = 336/625$. Which is easier for you to evaluate withour a calculator? Find the result with $336/625$ substituted for a.

Try letting $a = -7/25$. Which is easier for you to evaluate without a calulator? Find the result with $-7/25$ substituted for a.

16. Solve for x. (This problem is optional review. It is needed for calculus but will not be reviewed in this course.)

    (a) $\sqrt{2x + 3} = 3$

    (b) $|x - 3| = 8$

    (c) $2 \ge |x - 7|$

    (d) $x^3 - 3x^2 \ge 10x$

    (e) $\dfrac{x - 3}{x^2 - 4} \ge 0$

    (f) $|x + 1| \ge |x - 1|$