This review is about *process*. What I mean when I say "process" is that we have to develop confidence in the details of our solutions, since we generally do not have a solution to compare to when we are solving problems, and that is certainly true on tests. This confidence is what will serve you well during tests. And learning what you need to understand better is important in test preparation (never only redo problems you have already done as your only test preparation–you *must* be trying problems you have not done before as part of your preparation).

You can often determine if your answer is correct by
- doing the problem differently (find a common denominator to check a polynomial long division)
- working backwards from the solution (multiply out to check a factoring)
- checking using some facts (is the midpoint between two points on the line connecting the two points)
- spot checking at specific values of x (this won't guarantee correct answers, but can catch errors)
- comparing with other students solutions (make sure you each solved the problem completely on your own)
- sketch using a calculator (solving equations, to see if you have the correct zeros)

1. Terminology & Basic Facts

    (a) The degree of a polynomial is _____.

    (b) Write down an example of a polynomial in x of degree 3 _____.

    (c) The Square of a sum $(a + b)^2 =$ _____.

    (d) Perfect square $a^2 - 2ab + b^2 =$ _____.

    (e) Difference of squares $a^2 - b^2 =$ _____.

    (f) Difference of cubes $a^3 - b^3 =$ _____.

    (g) Sum of cubes $a^3 + b^3 =$ _____.

    (h) Is there a "sum of squares" formula for factoring $a^2 + b^2$? _____.

    (i) What is the lowest common denominator for the expression $\dfrac{3}{18(x - 2)} - \dfrac{1}{9(x - 2)^2}$? _____.

    (j) An equation that is satisfied by at least one real number but is not an identity is _____.

    (k) An equation that is satisfied by every real number is _____.

    (l) An equation that has no solution is _____.

    (m) The equation $|ax + b| = k$, $k > 0$ is equivalent to _____.

    (n) The equation $|A| = |B|$ is equivalent to _____.

    (o) The equation $|ax + b| = k$, $k < 0$ is equivalent to _____.

    (p) The equation of a circle of radius r and center (h, k) is given by _____.

    (q) The distance between two point (x_1, y_1) and (x_2, y_2) is given by $d =$ _____.

    (r) The midpoint of the lines segment with endpoints (x_1, y_1) and (x_2, y_2) is given by $d =$ _____.

    (s) Two lines are perpendicular if _____.

    (t) The solution to $ax^2 + bx + c = 0$ where $a \neq 0$ is given by the quadratic formula, $x =$ _____.

    (u) The inequality $|ax + b| > k$ is equivalent to _____.

    (v) The inequality $|ax + b| \geq k$ is equivalent to _____.

    (w) The inequality $|ax + b| \leq k$ is equivalent to _____.

    (x) Define what a *compound inequality* is _____.

2. Rules of exponents:

$a^0 =$ _____ if $a \neq 0$, $\qquad a^m a^n =$ _____, $\qquad \frac{a^m}{a^n} =$ _____, $\qquad (a^m)^n =$ _____,

$(ab)^n =$ _____, $\qquad \left(\frac{a}{b}\right)^n =$ _____, $\qquad$ radical notation: $a^{1/n} =$ _____.

3. Using long division of polynomials, determine the remainder when $2x^3 + 3x^2 - 7x - 12$ is divided by $x^2 - 4$.

4. Simplify the expression by finding a common denominator and canceling factors $\dfrac{ab}{a^3 + b^3} + \dfrac{a}{2a^2 - 2ab + 2b^2}$.

5. Solve the equation for x: $\dfrac{6}{x-3} = -\dfrac{5}{x-2} - \dfrac{5}{x^2 - 5x + 6}$. Identify the equation as an *identity*, an *inconsistent equation*, or a *conditional equation*.

6. Write the complex number $\dfrac{7-i}{3+2i}$ in the form $a + bi$, where $a, b \in \mathbb{R}$.

7. Find the equation of the line perpendicular to the line $3x + 4y + 7 = 0$ that passes through the point $(1, 3)$.

8. Find the equation of the line parallel to the line $3x + 4y + 7 = 0$ that passes through the point $(1, 3)$. Sketch the situation.

9. Solve the quadratic equation $2y^2 - 2y = 17$ using any technique you like.

10. Solve $|2 + x| + 13 > 15$. Write your answer in

   (a) set notation
   (b) interval notation
   (c) graph (sometimes called number line)

11. A mechanic is working on a car with a 20 qt radiator containing a 60% antifreeze solution. How much of the solution should she drain and replace with pure water to get a solution that is 50% antifreeze?

12. It takes Alphonse 90 minutes to clean his apartment. His roommate Edward takes 315 minutes to clean their apartment. How long will it take the two of them to clean their apartment when the work together?

13. Find the point on the x-axis $(a, 0)$ that is equidistant from the points $(1, 1)$ and $(3, -7)$.

14. Complete the square on the equation of the circle $x^2 + 5x + y^2 - y = \dfrac{5}{2}$, and identify the center and radius of the circle.

15. Write the complex number $(-i)^{17}(3 - i)$ in the form $a + bi$ where $a, b \in \mathbb{R}$.

16. Solve $|2 + x| + 13 = 15$ for x.

17. Solve $|2 + |x - 5|| + 12 = 15$ for x.

18. Solve the quadratic equation $\dfrac{1}{2}y^2 - 2y = 17$ by completing the square.

19. Simplify to an integer (remember, no calculators!) (a) $(81)^{3/4} =$ _____ (b) $\dfrac{1}{\sqrt{8}} - 64^{-1/4} =$ _____