Name_____

No notes are allowed when taking this test. A calculator is allowed, but no cell phone calculators. Be sure to follow the directions for each part of the test. You may do scratch work anywhere on the pages of this test. The yellow paper is also attached for that purpose. Turn in all you work, including any scratch work.

Part I. (2 points each) Write your answers on the appropriate lines in the answer column.

1. Simplify: $\sqrt{49x^{16}}$

1. $7X^8$

2. Simplify: $(5x^3y^5)^2$

2. $25X^6y^{10}$

3. Simplify: $\dfrac{10x^6y^2}{2x^2y^4}$

3. $\dfrac{5x^4}{y^2}$ or $5X^4y^{-2}$

4. Solve: $10 = \dfrac{7}{(X-5)} + 3$

4. $X = 6$

5. If $G(x) = 3(2^x)$, then determine the value of $G(3)$.

5. 24

6. If $G(x) = 3(2^x)$, then determine the value of $G(-1)$.

6. 1.5 or $\dfrac{3}{2}$

7. What is the y-intercept of the graph of $y = \dfrac{3}{(x+1)} + 2$?

7. 5

8. Find a rule for H(x), or (H(G(x)) where G(x) = 3x + 2 and G(x) = 2y + 1.

8. $OMIT$

9. Solve for P: $Q = \dfrac{3P-4}{5}$

9. $P = \dfrac{5Q+4}{3}$

10. The population of a country is currently 40 million and is growing at a compound rate of 4% per year. What will be the country's population in five years?

10. 48.67 million

Part II (5 points each). Show your work in the spaces provided. Identify any variables you introduce and express your conclusions using appropriate sentences.
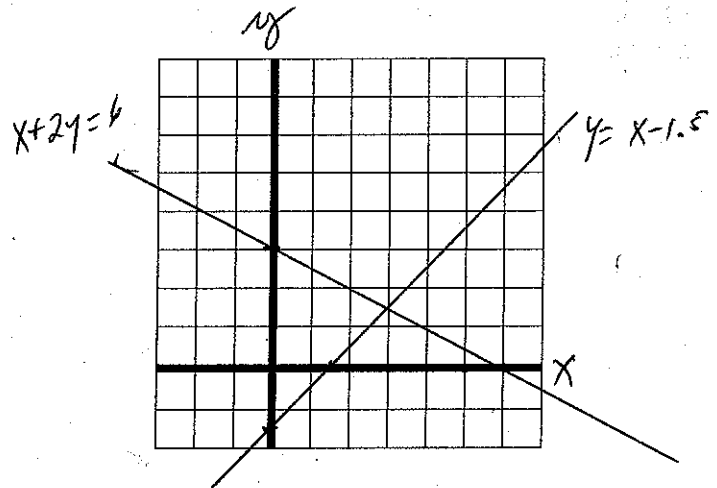
11. For the following system of equations, sketch a graph of the equations, and estimate the solution by looking for the point of intersection. Show how to determine whether or not your estimated solution is actually a solution.

$x + 2y = 6$
$y = x - 1.5$

My estimated solution is (3, 1.5).

Verification —
$3 + 2(1.5) = 3 + 3 = 6 ✓$
$1.5 = 3 - 1.5 = 1.5 ✓$

12. Show how to find a solution, if one exists, using a non-calculator, algebraic technique for the following system of equations. If no solution exists, explain how you know that is the case.

$2x - y = 3 \longrightarrow y = 2x - 3$
$2x + y = 17$

Substitute for y in 2nd equation

$2x + (2x - 3) = 17$
$4x - 3 = 17$
$4x = 20$
$x = 5$

So, if x = 5, $y = 2(5) - 3 = 7$

My solution is x = 5, y = 7 or (5, 7)

13. The graph of the function defined by $y = \frac{4}{x}$ contains the points (2, 2) and (8, 0.5). Find the equation of a second function whose graph will be the same as the graph of the given function given after the manipulation described below. Also, identify numbers a and b so that the points (2, a) and (4, b) are on the graph of the second function. On the same pair of axes, make rough sketches of the graphs of both functions. Your sketches should show proper concavity and appropriate relative locations for any intercepts.

Manipulation: shift 3 units left and then shift up 5 units
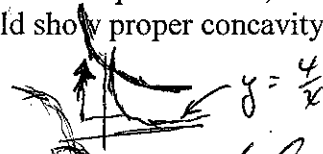
Two possible interpretations

1) Apply manipulation to the given function. After shifting the graph of $y = \frac{4}{x}$ as described, the resulting curve is the graph of $y = \frac{4}{x+3} + 5$ ← this curve contains the points (2, 5.8) and $(4, 5\frac{4}{7})$.

2) Apply manipulation to the 2nd function so that the resulting graph coincides with the graph of $y = \frac{4}{x}$. That 2nd function would be $y = \frac{4}{x-3} - 5$ ← this curve contains the points (2, -9) and (4, -1)

$y = \frac{4}{x}$

$y = \frac{4}{x-3} - 5$
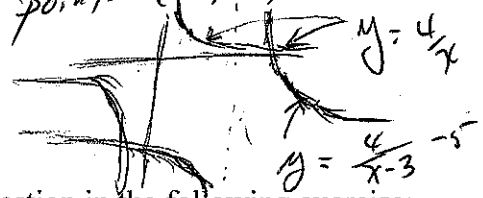
14. Write a rule for a function that will allow you to address the question in the following exercise; then address the question.

A movie was recently released. The box office revenues for the initial week of release were $20 million. Following that initial week, the box office weekly revenues decreased by 30% each week. What were the movie's box office revenues for the 5th week after the initial week?

Let t = the number of weeks after the 1st week
$R(t)$ = the revenue t weeks after the 1st week ($ millions)

$R(t) = 20(0.70)^t$

$R(5) = 20(0.70)^5 = 3.3614$ ✓ ✓

So, the box office revenue 5 weeks after the 1st week, the sixth week, was about

$3,361,400.