INSTRUCTIONS: *Show work for each problem. Credit will be earned based on the amount of correct work shown. Answers given without adequate justification will not receive full credit. Be sure to answer word problems with sentences. Circle your answers wherever possible.* **Scientific Calculators only. Calculators may not be shared.**

1. (6)   A company is planning to manufacture computer desks. The fixed cost will be $60,000 and it will cost $200 to produce each desk. Each desk will be sold for $450.   How many desks must be produced and sold for the company to make a profit?

   Start by defining the variable and writing the cost, revenue and profit functions.

   x = _____

   Cost Function:_____   Revenue Function:_____

   Profit Function:_____

2. (7)   Solve for y. (Be sure to check your solution(s)!)
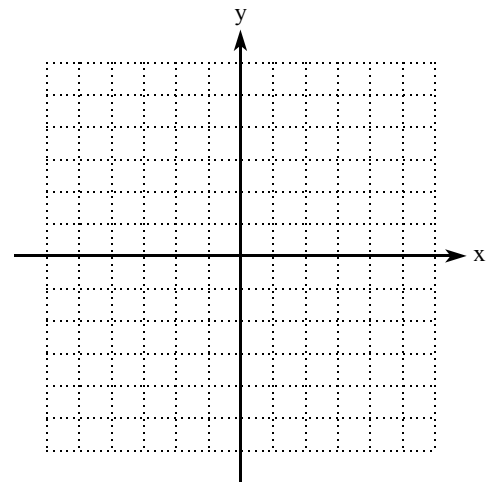
   $$\sqrt{3y+21} - y = 1$$

3. (6)   Solve the compound inequality. Give the solution set in **both graph** and **simplest interval** forms.
   $5x+3 \geq -7$ and $2x-1 < 7$.

4. (8) Graph the system of linear inequalities.

$y < -\frac{1}{3}x$

$3x - 4y > 12$

5. a.(3) Simplify:

$u^{1/2}u^{2/3}$

b.(3) Simplify. (Do not use a calculator. Show steps.)

$\left(27p^3\right)^{2/3}$

c.(3) Simplify. Write answer with positive exponents. (Do not convert to radical form.)

$$\dfrac{x^{2/3} \cdot y^{-3}}{\left(x^{1/3} \cdot y\right)^{-1}}$$

d.(3) Simplify the following expression by first writing it in exponential form. Do not use a calculator.

$\sqrt[10]{x^2}$

e.(3) Simplify. Assume x is a positive number.

$\left(36x^2\right)^{1/2}$

f.(4) Simplify. (Do not use a calculator. Show steps.)

$81^{-3/4}$

6. (4) a) Find: $\{2, 4, 6, 8, 10\} \cap \{4, 6, 12, 14\}$

b) Find: $\{1, 2, 3, 4, 5\} \cup \{3, 4, 5, 7, 8, 9\}$

7. (6) At a college production of *Aladdin*, 504 tickets were sold. The ticket prices were $6, $8 and $10, and the total income from ticket sales was $3500. The combined number of $6 and $8 tickets sold was 7 times the number of $10 tickets sold. How many tickets of each type were sold?
Define the variables precisely and then write a system of three equations and three unknowns. Then solve.

8. Solve the following absolute value inequalities and equations. Write the solution set in set notation for equations and in simplest interval form for inequalities. Justify all answers using the appropriate algebra or with an explanation. (Note: If a given equation or inequality has no solution, explain why.)

(5) a) $\left| \dfrac{1}{2}x - 5 \right| - 3 = 1$

(5) b) $|2x + 7| \le 5$

(6) c) $|3 - 4x| \ge 2$

(4) d) $|5z - 8| + 9 > 7$

(4) e) $|12t - 3| = -8$

9. (6) Rewrite the following square roots using "i". Simplify the radicals as much as possible.

    a. $\sqrt{-49}$ b. $\sqrt{-15}$ c. $\sqrt{-18}$

10. (2) Give the conjugate of the complex number $3 + 7i$.

11. (6) Simplify the following expressions. Express each answer in the form $a + bi$.

    (a) $3(4 - i) - (2 - 3i)$ (b) $(2 + 3i)(5 - 2i)$

12. (6) Write the quotient in standard $(a + bi)$ form.

$$\frac{3i}{4 - 2i}$$

Bonus Problems.

a.(2) Factor the following binomial on the set of complex numbers: $x^2 + 49$

b.(1) Simplify the following expression. Work must be shown for credit.

i^{46}