Name:
Recitation Instructor:
Recitation Day and Time:

College Algebra – FINAL EXAM – Spring 2019

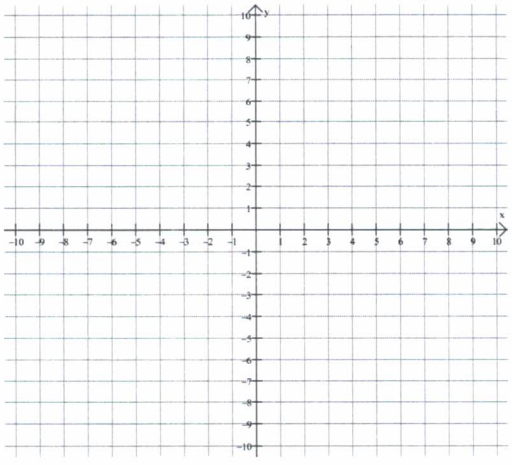
# 1-5 30 pts.	# 6-10 30 pts.	#11-15 30 pts.	#16-20 30 pts.	# 21-25 30 pts.	TOTAL 150 pts

Directions: You will find 25 problems listed below. Each problem is worth 6 points. Please show all your work neatly and box your final answers. No notes or books are allowed. Graphing calculator models above the level of a TI-84 plus are not allowed (in particular, calculators with a built-in CAS and/or QWERTY keyboard are not allowed). You have one hour and fifty minutes to complete this exam.

1. Find the distance between the two points $(-1, 8)$ and $(7, -9)$.

2. Solve for x in the equation $2(9x - 5) - 3 = -4(x + 2) + 12$.

3. Graph $y = -2x + 2$ on the grid below. Include at least 5 points on your graph, including the intercepts.



4. Suppose the total cost function for a certain product is given by $C(x) = 20x + 4200$ and the revenue function for the product is given by $R(x) = 600x$. Find a formula for the following functions:

   (a) Profit Function, $P(x)$

   (b) Average Cost Function, $\overline{C(x)}$

5. Find the domain of the function $f(x) = \dfrac{1}{5 - 16x}$.

6. Given $f(x) = 2x^2 - 7x + 11$ and $g(x) = x - 2$, find $(fg)(x)$.

7. Consider the graph of $h(x) = x^2$. Describe how the graph of $5h(x) + 4$ would look compared to $h(x)$.

8. Find the solutions to $3x^2 - x - 5 = 0$.

9. In a controlled lab environment, some organisms exhibit constant growth over a specific time period. Suppose a certain organism starts out weighing 1mg, and grows to 12 mg over a 48 hour time period. Find a linear model (in other words, find a linear function) that describes the growth of the organism for $0 \leq t \leq 48$ hours.

10. Find an equation of the line passing through $(1, -2)$ and perpendicular to $x + y = 8$.

11. Find the vertex of the quadratic function $C(x) = x^2 - 10x + 1$. Is the vertex a maximum or minimum, and how do you know?

12. Consider the polynomial $p(x) = 4x^6 - 10x^2 + x - 400$. Circle TRUE or FALSE for each of the statements below.

(a) TRUE FALSE $p(x)$ has odd degree.

(b) TRUE FALSE $p(x)$ has a negative y-intercept.

(c) TRUE FALSE $p(x)$ has positive leading coefficient.

(d) TRUE FALSE As $x \to \infty$, $p(x) \to \infty$.

(e) TRUE FALSE As $x \to -\infty$, $p(x) \to \infty$.

13. Consider the parabola $f(x) = (x + 3)^2 + 1$. Answer the following questions. (Drawing a quick sketch of the graph of $f(x)$ may help you.)

(a) What is the domain of $f(x)$?

(b) What is the vertex of $f(x)$?

(c) What is the range of $f(x)$?

(d) What is the axis of symmetry of $f(x)$?

14. Find $f^{-1}(x)$ when $f(x) = 2x + 5$.

15. Given $g(x) = x^2 - 5x$ and $h(x) = x + 3$, find $g(h(x))$.

16. Expand completely using properties of logarithms (you may assume all variables to be positive): $\log\left(10000x^4\sqrt{y}\right)$

17. Solve and check the following rational equation: $\dfrac{2}{4x-1} = \dfrac{3}{x+2}$

18. Solve and check: $x - 2 = \sqrt{3x+4}$

19. Solve: $||x-3|-20| = 2$.

20. Suppose A is a 2x2 matrix, B is a 3x2 matrix, and C is a 3x3 matrix. Also, assume that all these matrices have real valued entries. Beside each of the following, write down the size of the resulting matrix. If undefined, write down 'undefined.'

(a) $2A$

(b) $A+B$

(c) BC

(d) CB

(e) $3B$

21. Given that $x = 1$ is a zero of $p(x) = x^3 - 7x + 6$, find all the other zeros, real or complex, of $p(x)$.

22. Solve the rational inequality $\frac{x+4}{x} \leq 0$, remembering to check endpoints.

23. Suppose \$700 is invested in an account paying 2% annual interest, compounded continuously. Using an exponential growth model, determine the time required for the initial investment to triple.

24. Given matrices A and B below, find the product $A^{-1}B$. (Note: Treat a and c as unknown parameters in all your calculations.)

$$A = \begin{pmatrix} 3 & a \\ 0 & 2 \end{pmatrix}$$

$$B = \begin{pmatrix} 4 & 5 \\ 2 & c \end{pmatrix}$$

25. Solve the following system using any of the of methods discussed in class (the calculator method is NOT allowed):

$$3x - 4y = 6$$
$$2x + 2y = 5$$