Name:
Recitation Instructor:
Recitation Day and Time:

TRADITIONAL College Algebra – FINAL EXAM – December 2019

#1-5	#6-10	#10-15	#16-20	TOTAL
37 pts.	38 pts.	37 pts.	38 pts.	150 pts

Directions: You will find 20 problems listed below. Please show all your work. 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).

1. (7 points) Solve for x: $6(x - 5) + 1 = 4(x + 3) - 12$

2. (8 points) Find an equation of the line passing through $(2, -1)$ and parallel to $2x + y = 5$.

3. (7 points) Given $f(x) = 3x^2$ and $g(x) = x + 1$, find $(fg)(-4)$.

4. (8 points) Suppose a rational function has poles (vertical asymptotes) at $x = 2$ and $x = -3$, zeros at $x = 5$ and $x = 1$, and a horizontal asymptote $y = 3$. Find a possible rational function that has such attributes.

5. (7 points) In a controlled lab environment, some organisms exhibit constant growth over a specific time period. Suppose a certain organism starts out weighing 1 mg, and grows to 1.4 mg over a 24 hour time period. Find a linear model that describes the growth of the organism for $0 \le t \le 24$ hours.

6. (8 points) Given $g(x) = 7x - 4$, find the difference quotient $\dfrac{g(x + h) - g(x)}{h}$.

7. (7 points) Find the solutions and check your answers: $|8x + 3| = 4$.

8. (8 points) Find the solutions to $x^2 + 5x - 13 = 0$. Leave answers in simplified radical form.

9. (7 points) Solve the quadratic inequality $x^2 + 5x > 0$.

10. (8 points) Given that $x = 2$ is one zero of $p(x) = x^3 - 8$, find all the other zeros, real or complex, of $p(x)$.

11. (7 points) Solve: $4\log_3(5x - 1) - 1 = 7$. Leave answers exact (in other words, don't use a calculator).

12. (8 points) Solve the following system of equations. If there is no solution, state "no solution." If there are infinitely many solutions, make sure you describe the solutions (like we did during lecture).

$$2x - 3y = 6$$
$$4x - 6y = 12$$

13. (7 points) Find $f^{-1}(x)$ when $f(x) = 8x - 1$.

14. (8 points) Suppose $R(t) = 4t$ is a function that gives the radius of a circular oil spill at t minutes. Given $A(r) = \pi r^2$, find an expression for $A(R(t))$, and leave your final answer in terms of π.

15. (7 points) Solve the rational inequality: $\dfrac{3x + 9}{x - 4} \leq 0$. Be sure to justify your anwer using appropriate methods.

16. (8 points) Find the inverse of the following matrix:

$$\begin{pmatrix} 2 & 4 \\ 1 & -5 \end{pmatrix}$$

17. (7 points) Suppose $3400 is invested in an account paying 3% annual interest, compounded continuously. How much time is required for the initial investment to triple?

18. (8 points) Solve: $3 + 2e^{(x+1)} = 5$. Leave answers exact (in other words, don't use a calculator).

19. (7 points) Find the product CD for the matrices given below. Show all work!

$$C = \begin{pmatrix} 2 & x \\ y & -5 \end{pmatrix} \qquad D = \begin{pmatrix} 5 & 3 \\ 6 & -1 \end{pmatrix}$$

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20. (8 points) Set up and solve a system of equations using 2 variables: Cashews cost $10.00 per pound, while almonds cost $12.00 per pound. How much of each type is needed to create 8 pounds of a mixture that costs $10.25 per pound?