Name:
Recitation Instructor, Day, Time:

TRADITIONAL MATH 100 – FINAL EXAM – Spring 2022

1. (8 points) Consider $m(x) = x^2 + 3x$. Answer the following:

   (a) Find $m(2)$.

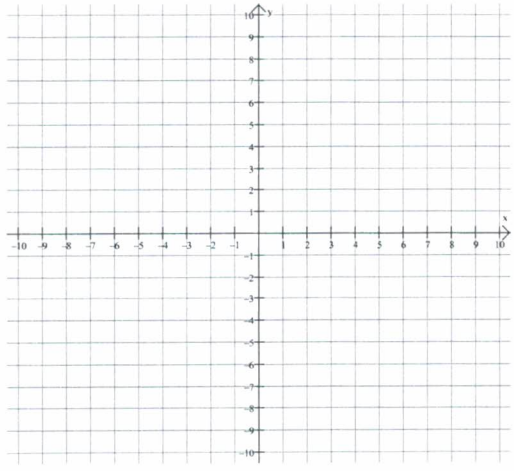
   (b) Find $m(-3)$.

   (c) Find $m(a)$ where a is some generic input value.

   (d) Find $m(x+1)$, and expand completely.

2. (6 points) Solve for x in the equation $4(3x-1)+2 = 2(x-3)+1$.

3. (8 points) Graph $y = \frac{2}{3}x + 1$ on the grid below. Include at least 4 points on your graph, including the intercepts. Please include a table of ordered pairs as part of your work.



4. (6 points) Consider $x + y = 5$. Is y a function of x? Explain in COMPLETE SENTENCES, using terminology learned in class.

5. (8 points) Consider the function $k(x) = (x-5)^2 - 9$.

   (a) Find the y-intercept of $k(x)$.

   (b) Find the x-intercept(s) of $k(x)$.

6. (8 points) Find the solutions and check your answers: $4 + 3|x + 5| = 10$.

7. (8 points) Find the solutions to $x^2 + 7x + 6 = 0$.

8. (8 points) In a controlled lab environment, some organisms exhibit constant growth over a specific time period. Suppose a certain organism starts out weighing 4 mg, and grows to 10 mg over a 24 hour time period. Find a linear model (in other words, find a linear function) that describes the growth of the organism for $0 \leq t \leq 24$ hours.

9. (6 points) Find an equation of the line passing through $(3, -4)$ and perpendicular to $x + y = 2$.

10. (8 points)

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

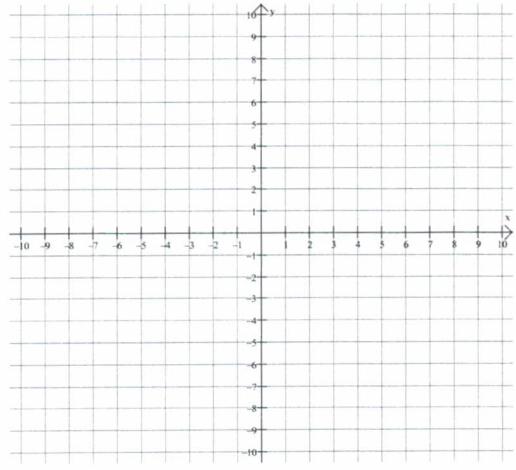
(a) What is the domain of $f(x)$?

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

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

(d) What is the axis of symmetry of $f(x)$? Write your answer as an equation, like how we learned in lecture.

11. (8 points) Graph the function $f(x) = \sqrt{x}$ on the graph below, include at least 4 points on this graph.Then, using your graph, solve the inquality $f(x) = \sqrt{x} > 2$.

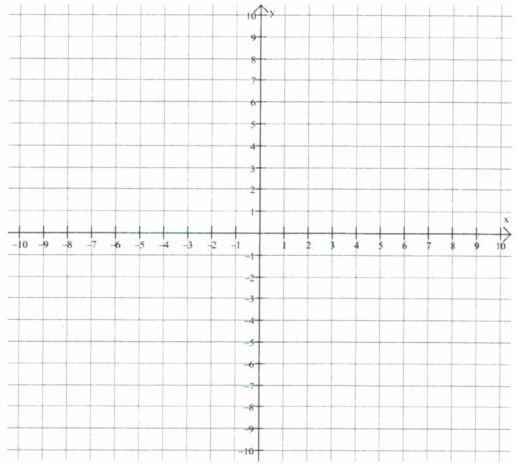


12. (8 points) Find a 3rd degree polynomial with zeros at $x = 5$, $x = 1$ and $x = 0$, that also passes through the point $(2, 9)$.

13. (6 points) Simplify and write in standard $a + bi$ form: $(13 - 6i)(1 + 4i)$

14. (6 points) Find the domain of the function $f(x) = 10 + \log(4x + 1)$.

15. (8 points) Graph the rational function $r(x) = \dfrac{x^2 - 25}{x + 5}$.



16. (8 points)In lecture we learned about a formula to find the inverse of a 2×2 matrix. Given A below, write down the formula for A^{-1}.

$$A = \begin{pmatrix} a & b \\ c & d \end{pmatrix}$$

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17. (8 points) Find the inverse of the following matrix:

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

18. (8 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?

19. (8 points) Find the product CD for the matrices given below. Assume that M and R are constants. Show all work!

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

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