

Math 1090 Practice Final Part 1

Name: _____

Show all work. Write your answer in the space provided. Please box your answer.

1. Below are several matrices. Perform the indicated operations or state that it is not possible.

$$A = \begin{bmatrix} 1 & 2 \\ 2 & 1 \end{bmatrix}, B = \begin{bmatrix} 1 & 3 & 1 \\ 2 & 1 & 1 \end{bmatrix}, C = \begin{bmatrix} -1 & 1 \\ 2 & 1 \end{bmatrix}, D = \begin{bmatrix} -1 & 1 \\ 1 & 1 \\ 3 & 4 \end{bmatrix}$$

- (a) $A + C$
 - (b) $B + D^T$
 - (c) A^T
 - (d) AB
 - (e) BA
 - (f) DA
 - (g) AD
 - (h) $2A - 3C$
 - (i) A^{-1}
 - (j) BC
2. Solve the system of linear equations

$$x - 2y + z = 0 \tag{1}$$

$$2y - 8z = 8 \tag{2}$$

$$-4x + 5y + 9z = -9 \tag{3}$$

3. State the domain and range for the following functions

- (a) $y = \sqrt{x+4}$
 - (b) $y = ax + b$
 - (c) $\ln x$
 - (d) $\log_2(2x - 1)$
 - (e) e^x
 - (f) $\frac{1}{x-1}$
 - (g) $\frac{\ln x}{x}$
4. Let $f(x) = e^{-x}$ and $g(x) = \frac{1}{x^2}$. State the domain and range for both functions.
- (a) State the domain and range for both functions.
 - (b) Find $(f + g)(x)$
 - (c) Find $f \circ g(x)$. What is the domain and range of this function?
 - (d) Find $g \circ f(x)$
 - (e) Find $g \circ g(x)$
 - (f) Find $f \circ g \circ f(x)$

5. Let $y = 2x^4$. Is y a function of x ?

6. Solve the equation $\frac{2x+5}{x+7} = \frac{1}{3} + \frac{x-11}{2x+14}$ for x .

7. Solve for x : $2x + \frac{1}{2} = \frac{x}{2} + \frac{1}{3}$
8. If $f(x) = 3x - x^2$ find $\frac{f(x+h)-f(x)}{h}$
9. Find a linear equation $y = mx + b$ with slope equal to $-\frac{3}{2}$ that passes through the point $(x, y) = (-1, 2)$.
10. A calculator factory makes calculators for a math 1090 with cost function of $C(x) = \frac{x^2}{100} - x + 10000$ where x is the number of calculators made. The factory sells these calculators to the poor souls for 60 bucks a pop. How many calculators do they have to sell to start to turn a profit? Is there a point where if they make even more calculators that their profit will dwindle and go into the red?
11. Let $y = x^2 + 3x - 4$
 - (a) Find the vertex of the parabola. Is it a minimum or a maximum point?
 - (b) find the roots of the parabola.
 - (c) Sketch the graph of the parabola noting the roots, y-intercept, and slope at the y-intercept.
12. Write down $3^x = y$ in log form.
13. Simplify the following using log and exponent rules. Calculator answers are NOT accepted!
 - (a) solve for x : $\log_x(81) = 2$
 - (b) $\log_{10}(\frac{1}{10})$
 - (c) $\ln \sqrt{e}$
14. Express $\log_b(c) = f$ in log base a using the change of base formula.
15. Use rules of logs and exponents to rewrite $e^x = y$ as an exponential in base 2. i.e. $y = e^x = 2^{rx}$ for some r . Find that r using algebra only. Calculator answers not allowed!
16. Let $f(x) = 10e^{-2x}$ and let $g(x) = 2^{(-\frac{x}{3})}$. Find x so that $f(x) = g(x)$ using algebra only. Calculator answers not allowed!
17. Solve for x . $\ln(x^2 - 3x + 3) = 0$
18. Suppose you want to save money in an account for retirement that has a 4% APR compounded quarterly. Suppose you are 25 years old and so retirement is 40 years away. You put in 1200 dollars to the account at the end of each quarter for 20 years. for the next 20 years you no longer put any money in. How much do you have after 40 years?
19. Suppose you win the lottery and get 1.2 million dollars. You put this money in a 50-year trust fund with a 5% APR compounded weekly. How much will you receive each week? How much will all your payments total to?
20. Suppose you want to buy a house and you can afford a monthly payment of at most \$900. The bank approves you for a 30-year loan with a 3.4% APR compounded monthly. What is the most expensive house you can afford?