

MTH112 Final Exam

1. (15 pts.) Plot and label the following on the given axes (each square represents 1 unit)...

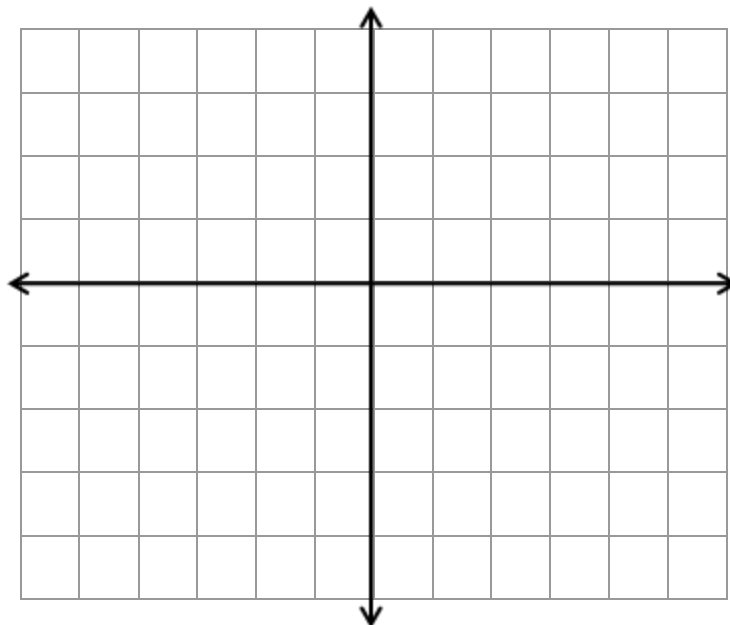
(A) Point $(4, -2)$

(B) Line $y = \frac{1}{2}x - 1$

(C) Function $f(x) = -|x| + 3$

(table is optional but may help)

x	y =	(x, y)
-2		(,)
-1		(,)
0		(,)
1		(,)



2. (8 pts.) Given functions $f(x) = x^2 - 3x$ and $g(x) = 5x + 10$, find the following...

$$f(-5) =$$

$$f(-x) =$$

$$g(f(x)) =$$

$$g^{-1}(x) =$$

3. (7 pts.) Given points $(4, -3)$ and $(2, 7)$ determine...

a. (2 pts.) The slope of the line connecting the two points

- b. (3 pts.) The equation of the line connecting the two points (in slope-intercept form)

Hint: $y = mx + b$

- c. (2 pts.) The slope of a line perpendicular to this line

4. (4 pts.) Write the standard form of the equation of the circle with center **(3, - 1)** and radius **5**

Hint: $(x - h)^2 + (y - k)^2 = r^2$

5. (4 pts.) Circle the 4 correct answers in the following statement...

The graph of $f(x) = \sqrt{x + 4} - 3$ is the graph of $g(x) = \sqrt{x}$ shifted

UP - or - DOWN by 4 - or - 3 units

- and -

RIGHT - or - LEFT by 4 - or - 3 units

6. (6 pts.) Solve / simplify the following expressions and express the result in standard form **(a + bi)**

$$(3 - 5i)(2 + 6i)$$

$$\frac{5+3i}{1-2i}$$

7. (4 pts.) Divide using polynomial or synthetic division $(6x^3 - 17x + 1) \div (x - 2)$

q(x):

r(x):

8. (4 pts.) Find the zeros (solutions/roots) of the polynomial function $f(x) = x^3 - 5x^2 - 13x - 7$

9. (6 pts.) The polynomial function $f(x) = x^3 + 3x^2$ can be factored as $x^2(x + 3)$, yielding two solutions...

$x = \underline{\hspace{2cm}}$ with multiplicity $\underline{\hspace{2cm}}$

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At this x , the graph of $f(x)$... (circle answer)

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Crosses the x -axis -- or --

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Touches the x -axis and turns around

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10. (2 pts.) The graph of $\frac{x}{x-3}$ is undefined and has a vertical asymptote at $x = \underline{\hspace{2cm}}$

11. (4 pts.) The number of gallons of water, W , used when taking a shower varies directly with time t . A shower lasting 6 minutes used 30 gallons of water. How much water is used in a shower lasting 8 minutes?

12. (4 pts.) Find the solution set of the inequality $2x^2 + 3x - 9 < 0$ and write answer in interval notation

Hint: Factor, find boundary points, use number line / test points

13. (4 pts.) Evaluate

$$\log_4 64$$

$$\log_{25} 5$$

14. (6 pts.) Use the logarithmic properties to expand each logarithmic expression as much as possible

$$\ln(3a)$$

$$\log(5x^2)$$

15. (6 pts.) Write each expression as a single logarithm

$$2 \log(x) + \log(y)$$

$$2\ln(a) - \ln(b)$$

16. (6 pts.) Solve the following equations (**ROUND TO 2 DECIMAL PLACES**)

$$7e^{3x} + 5 = 33$$

$$\log(x) + \log(7) = 1$$

17. (3 pts.) If you were to open a savings account today and invest \$2000 (to provide your awesome algebra teacher a vacation in the Bahamas) with an interest rate of 5% continuously compounded, how much money would you have in the account 5 years from now (**ROUND TO 2 DECIMAL PLACES**)?

Hint: Use formula from section 3.1 $\Rightarrow A = Pe^{rt}$

18. (3 pts.) Is the point **(4, 3)** a solution to $\begin{cases} x + 2y = 10 \\ 3x - 5y = 3 \end{cases}$ (you must show work to receive credit)?

19. (4 pts.) Solve the linear system of equations $\begin{cases} x - 2y = 3 \\ 3x + 2y = 25 \end{cases}$

BONUS:

1. (1 pt.) Solve the factorial **4!**

2. (2 pts.) Apply the quadratic formula find the real and /or complex solutions / roots of **$f(x) = x^2 - 2x + 17$**

3. (3 pts.) What are your exciting summer plans?

----- Formulas -----

$$y = mx + b$$
$$m = (y_2 - y_1) / (x_2 - x_1)$$

$$\log_b MN = \log_b M + \log_b N$$
$$\log_b (M/N) = \log_b M - \log_b N$$
$$\log_b M^x = x \log_b M$$

$$\text{zeros} = \frac{\text{factors of constant}}{\text{factors of lead coeff}}$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$