

Math 111
Final Exam

Name _____
Section _____ Date _____

To receive full credit, show your work.

1. Find the equation of the line passing through the point $(3, -2)$, and parallel to the line $y = -3x + 5$.

- a. $y = -3x + 7$ b. $y = -3x - 11$ c. $y = -3x + 11$ d. $y = -3x + 8$

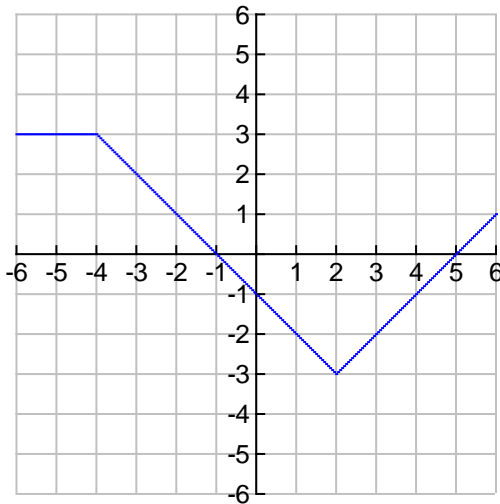
1. _____
2 points

2. $f(x) = 2x^2 - x + 5$. Find $f(x-1)$.

- a. $2x^2 - 5x + 7$ b. $2x^2 - x + 4$ c. $2x^2 - 5x + 6$ d. $2x^2 - 5x + 8$

2. _____
2 points

3. Refer to the graph of $f(x)$ below. Find $f(-4) - f(2)$



- a. 1 b. 2 c. 5 d. 6

3. _____
2 points

4. Use the quadratic formula to solve the equation, $x^2 + 2x = -10$. The solutions are:

- a. $3+i, 3-i$ b. $-1+3i, -1-3i$ c. $3+2i, 3-2i$ d. $1+3i, 1-3i$

4. _____
2 points

5. A rock falls from an airplane 576 ft. high. As it falls, its height, h , is given by the formula, $h = 576 - 16t^2$ where t represents time in seconds. When the rock hits the ground the height equals 0. How many seconds does it take to hit the ground?

- a. 4 b. 5 c. 6 d. 7

5. _____
2 points

6. Solve the inequality $x^3 - 9x \leq 0$. Express the answer in interval notation.

- a. $[-3, 0] \cup [0, 3]$ b. $(-\infty, -3] \cup [0, 3]$ c. $(-\infty, 0] \cup [-3, \infty)$ d. $[-3, 0] \cup [3, \infty)$

6. _____
2 points

7. Solve the system of equations for x and y . $y = x^2 - 5x + 10$ The sum of x and y is:
 $3x - y = 6$

- a. 7 b. 8 c. 9 d. 10

7. _____
2 points

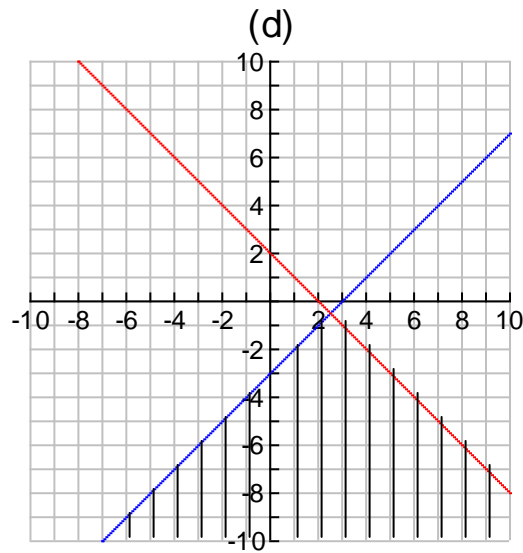
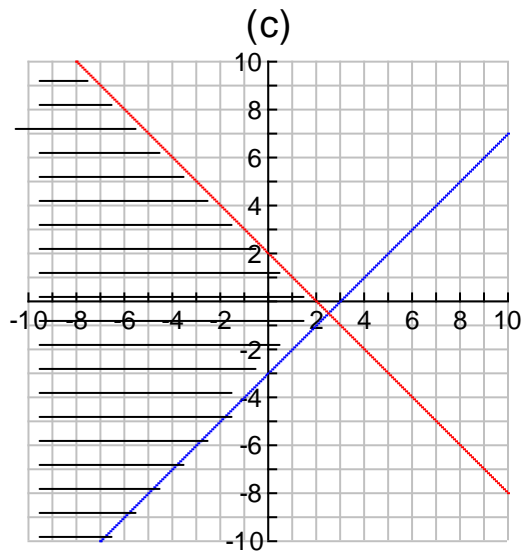
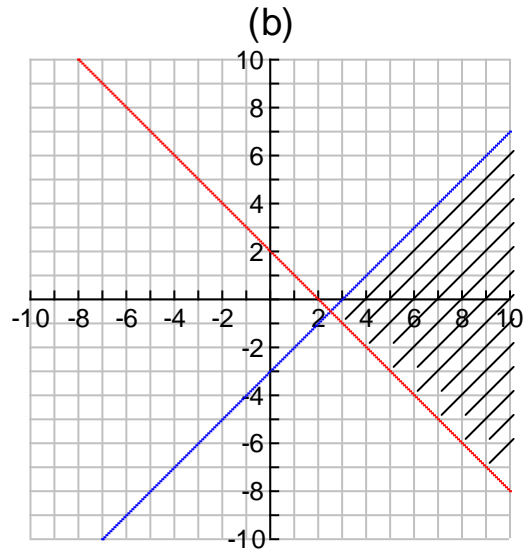
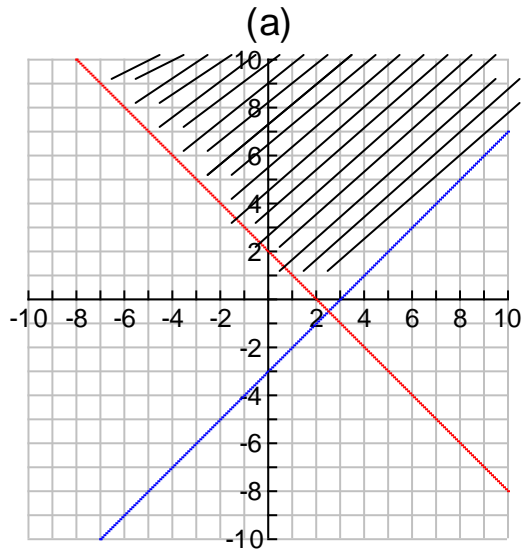
8. The profit for a company's first 5 years of business is shown in the table. Use a graphing calculator to fit the data with a linear function, $y = ax + b$. Using the linear function, predict the profit in year 7.

Year (x)	1	2	3	4	5
Profit, in thousands, (y)	27	30	36	41	45

- | | | | |
|----------------------|----------------------|----------------------|----------------------|
| linear function | profit, in thousands | linear function | profit, in thousands |
| a. $y = 4.7x + 21.7$ | 54.6 | c. $y = 4.7x + 20.5$ | 53.4 |
| b. $y = 5.1x + 20.3$ | 56.0 | d. $y = 5.2x + 21.3$ | 57.7 |

8. _____
2 points

9. Graph the solution of the system of inequalities.
- $$y \leq x - 3$$
- $$y \geq -x + 2$$



9. _____
2 points

10. The population of Kenya has an exponential growth rate of 2.1% and an initial population of 24 million people. Using the exponential growth function, $P(t) = P_0 e^{kt}$, find t , the number of years it takes the population to double. Round to the nearest whole year.

- a. 28 years b. 31 years c. 33 years d. 35 years

10. _____
2 points

11. Factor Completely. $4n^3 + 108$

11. _____
2 points

12. Write in simplest form with only **positive exponents**.

$$\left(\frac{x^{-4}y^3}{3x^{-5}y^8}\right)^3$$

12. _____
3 points

13. Simplify. $\frac{x}{x^2 + 9x + 20} - \frac{4}{x^2 + 7x + 12}$

13. _____
3 points

14. Given two points A(4, -6) and B(1, 0).

a) Find the distance between A and B. Give exact value.

a. _____
2 points

b) Find the slope and write the equation of the line AB in **standard form**.

b. _____
3 points

15. For $f(x) = x^2 + 10$ and $g(x) = \sqrt{x-1}$, find

a. $f \circ g$

a. _____
2 points

b. $g(f(0))$

b. _____
1 point

16. Solve the equation $\frac{x}{x+4} = \frac{3}{x-1}$

6. _____
3 points

17. Solve the inequality, writing your answer in interval notation.
 $-3 \leq 2x + 3 < 6$

7. _____
3 points

18. Find the following for $f(x) = 2x^2 - x - 36$.

a. x-intercepts

a. _____
2 points

b. y-intercept

b. _____
1 point

c. vertex

c. _____
2 points

d. line of symmetry

d. _____
1 point

19. Perform the following operations:

a. $3 - 4i + 4 + 2i$

a. _____
1 point

b. $3 - 4i - 4 + 2i$

b. _____
1 point

c. $3 - 4i \cdot 4 + 2i$

c. _____
2 points

d. $\frac{3 - 4i}{4 + 2i}$

d. _____
2 points

20. Consider the polynomial function $P(x) = (x+1)^3(x+2)(x-2)^2$.

a. Determine the degree of the polynomial. a. _____
1 point

b. Determine the zeros of the function and state the multiplicity
3 points

ZERO VALUES

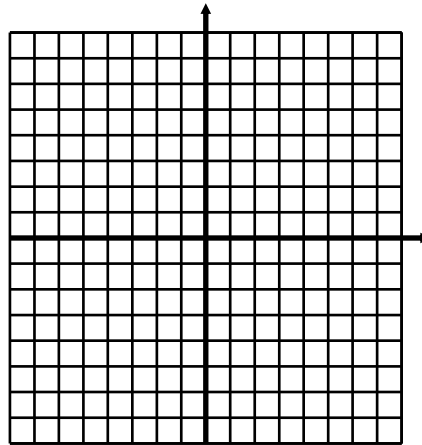
MULTIPLICITY

c. Determine the end behavior of the graph of the function.

C. _____
2 points

d. Determine the y-intercept of the function. d. _____
1 point

e. Sketch the graph of the function. 3 points



21. Given that 1 and 3 are zeros of the function $P(x) = x^4 - 4x^3 + 7x^2 - 16x + 12$, find the remaining zeros.
Show all work to receive credit.

21. _____
3 points

22. Consider the function: $f(x) = \frac{3x^2 + 5x - 2}{x^2 + x - 12}$

- a. Give the **equation(s)** of any vertical, horizontal, or oblique asymptotes of the function.

Vertical asymptotes: _____
2 points

Horizontal asymptote: _____
1 point

Oblique asymptote: _____
1 point

- b. Determine the coordinates of the **x** and **y-intercepts**

X-intercept(s): _____
2 points

Y-intercept: _____
1 point

23. a. How would you obtain the graph of $f(x) = \log\left(x - \frac{5}{2}\right) - 1$ from the graph of $f(x) = \log x$?

2 points

- b. What is the domain of the function in part a? (Give the answer in set builder notation)

b. _____
2 points

24. Suppose \$4500 is invested at 3.5%, compounded monthly. How much will be in the account after 3 years? $A = P\left(1 + \frac{r}{n}\right)^{nt}$

24. _____
3 points

25. Simplify using the rules of logarithms (must show steps and do not use calculator):

$$5\log_4 2 + \log_4 2$$

25. _____
3 points

26. Solve: $2\log_3 x - \log_3 x - 2 = 2$

26. _____
3 points

27. Solve analytically:
$$\begin{aligned} 2x + 3y &= -1 \\ 3x - y &= 4 \end{aligned}$$

27. _____
3 points

28. **Write a system of equations and solve** the following application. Toby split his savings into two different investments, one earning 5% and the other earning 7%. He put twice as much in the investment earning 7%. In one year he earned \$475 in interest. How much money did he invest in each account?

28. _____
4 points

29. Solve the system of equations using matrix methods. Write the matrix equation $AX = B$ and give solution in the form (x, y, z) .

$$2x - 2y + 3z = -1$$

$$2x - 6y - 4z = 9$$

$$x + y + z = -6$$

- a. Write the matrix equation, $AX = B$. a. _____
2 points

- b. Find A^{-1} , fractions only. b. _____
2 points

- c. Give solution in ordered triple, fractions only. c. _____
2 points

Notice

A grade of "C" or better in Math 111 is required to take Math 115 or Math 215, or if this course is to be applied to a teaching degree.

A passing grade (D or better) is required to take Math 118 or for this course to satisfy the A_2 , Mathematics component of the University Core Curriculum.