

Polynomials – extra practice

NO Calculator-

1. Graph  $y = -x^2 + 2x + 8$

a) axis of symmetry \_\_\_\_\_

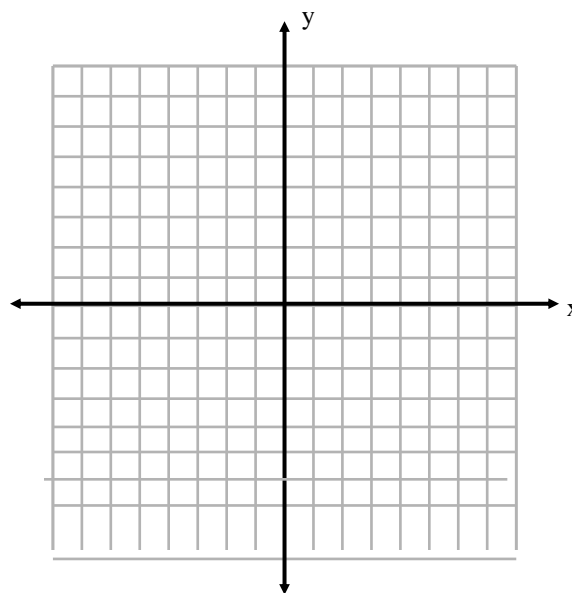
b) vertex \_\_\_\_\_

c) x-intercept(s) \_\_\_\_\_

d) y-intercept \_\_\_\_\_

e) equation in vertex form

\_\_\_\_\_

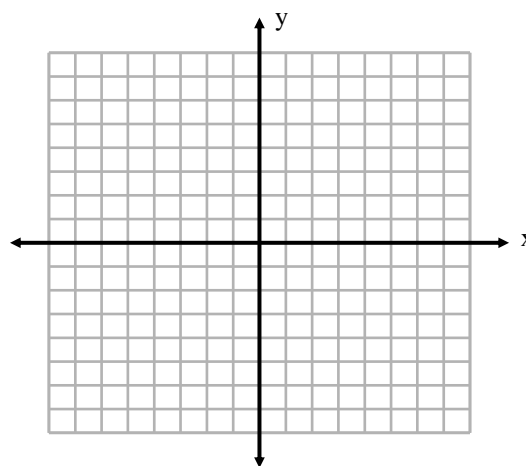


2. Graph  $f(x) = x^4 - 13x^2 + 36$

a) Draw the left/right (end) behavior

b) List the zeros

c) Factor completely



3. Simplify by combining like terms:  $(9 + \sqrt{-4}) - 6i + 12 - \sqrt{-9}$

4. Simplify:  $\frac{3 - 2i}{2 - i}$

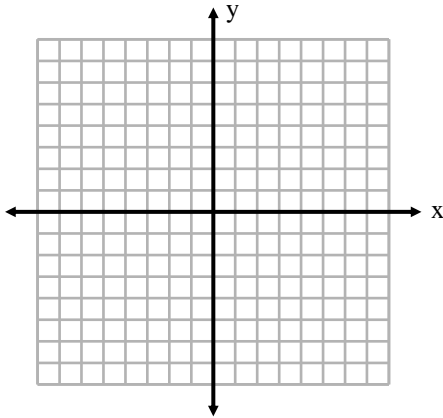
For #5-6, give the **domain, asymptotes, intercepts and draw graph.** (if none, write none)

5.  $f(x) = \frac{x^2 - 1}{x - 2}$

D: \_\_\_\_\_ V.A.: \_\_\_\_\_

H.A.: \_\_\_\_\_ S.A.: \_\_\_\_\_

x-ints: (    ), (    ) y-int: (    )

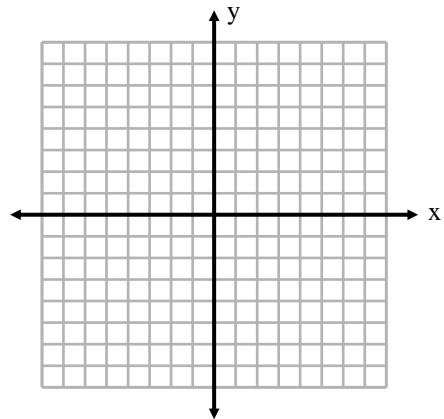


6.  $f(x) = \frac{2x + 6}{x^2 - 9}$

D: \_\_\_\_\_ V.A.: \_\_\_\_\_

H.A.: \_\_\_\_\_ S.A.: \_\_\_\_\_

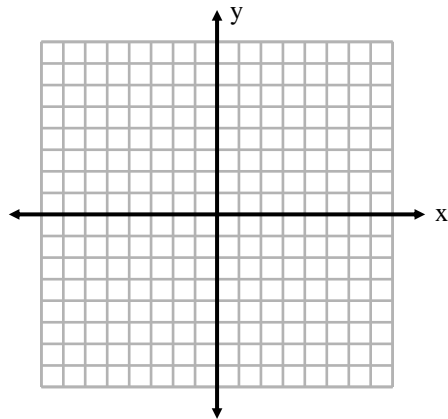
x-int: (    ) y-int: (    )



7. Solve  $\frac{5x}{x^2 - x - 12} \geq 0$

**Graphing calculator allowed.**

1. Graph  $f(x) = \frac{3x^2 + 15}{2x^2 + 4}$ . (List all intercepts/asymptotes)



2. Divide:  $(3x^4 + 2x^3 - 3x + 1)$  by  $(x^2 + 1)$

3. Write a polynomial function with the following zeros:  $1, 2, \pm 3i$

4. Find all the rational zeros of  $f(x) = 6x^4 + 32x^3 - 70x^2$  (Support answers algebraically.)

5. Factor completely:  $f(x) = x^4 - 5x^3 + 8x^2 - 20x + 16$ .

6. The profit  $P$  for a certain company is given by  $P(x) = -2x^2 + 28x - 48$  where  $x$  is the number of units produced.

a. Find the maximum profit?

b. When will the company make money? (Hint: profit must be greater than 0)

7. Perform the operation and simplify.  $(1 - 2i)^2 - (1 + 2i)^2$

8. Write a rational function with the following properties. Vertical Asymptotes  $x = -2$ ,  $x=1$   
Horizontal Asymptote  $y = -3$ , Zeroes of  $(3,0)$  and  $(-3,0)$

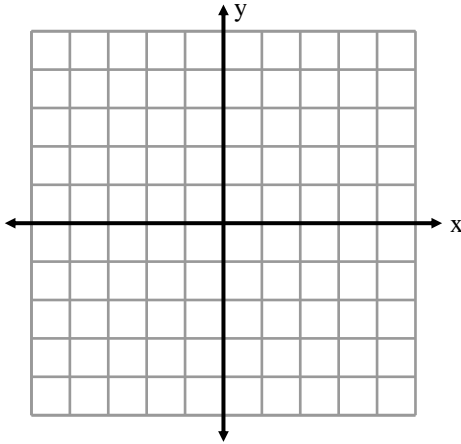
9. An open box is made from a square piece of material by cutting equal squares with sides of length  $x$  from all corners and turning up the sides. The volume of the box is  $V(x) = 5x(8 - x^2)$ . Find the value of  $x$  for which the volume is maximized. (use 3 decimal places.)

Exponential and Logarithms extra practice

**No Calculator**

Graph. Label the asymptotes and at least 2 points.

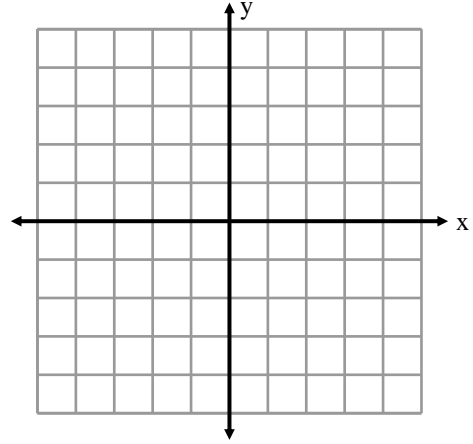
1.  $f(x) = \log_3(x+1)$



Domain: \_\_\_\_\_ Range: \_\_\_\_\_

Asymptote: \_\_\_\_\_

2.  $f(x) = -3(2)^x + 1$



Domain: \_\_\_\_\_ Range: \_\_\_\_\_

Asymptote: \_\_\_\_\_

Simplify:

3.  $7^{\log_7 5x}$

4.  $\log_3 \frac{1}{3}$

5.  $e^{3 \ln x}$

Evaluate:

6.  $\log 0.01$

7.  $\log_5 \left( \frac{1}{125} \right)$

8.  $\log_{10} [\log_3 (\log_4 64)]$

Condense and simplify each logarithm (condense):

9.  $2 \log_b 4 + \log_b 10 - \log_b 2 - \log_b x$

10.  $\log_b 36 - \log_b 6 + \log_b 3 - 2 \log_b y + 4 \log_b x$

Expand.

$$11. \log_6 \left( \frac{m^2 k}{36y^3} \right)$$

$$12. \ln \frac{(x-1)^2 \sqrt{x+5}}{x^3}$$

Solve.

$$13. \log_3 x + \log_3 (x-5) = \log_3 6$$

$$14. \log_6 (x^2 + 16) = \log_6 80$$

$$15. 64^x = 16^{3x-2}$$

$$16. \log_{16} (9x+5) - \log_{16} (x^2 - 1) = \frac{1}{2}$$

17. Write in exponential function of the form  $y = ab^x$  whose graph passes through the following points:

$$(-1, 6), \left( 2, \frac{16}{9} \right)$$

Calculator allowed. Solve problems 18-22, approximate answers to three decimal places.

18.  $\log_6 50 = x$

19.  $2.5^x = 20$

20.  $4.2^{2x-1} = 15$

21.  $9^x = \left(\frac{1}{3}\right)^{x+1}$

22.  $\log(3x + 7) + \log(x - 2) = 1$

Solve and round to the nearest hundredth, two decimal places.

23. Zeller Industries bought a computer for \$4600. It is expected to depreciate at a continuous rate of 20% a year. When will the value have depreciated to \$2000. (Use  $f(t) = ae^{-bt}$ )

24. Suppose \$2500 is invested at 7% annual interest.

a) Find the amount after 5 years, if the interest is compounded quarterly.

b) Find the amount after 10 years, if the interest is compounded monthly

c) Find when will the investment be worth \$10000, if the interest is compounded continuously.

d) If compounded continuously how long will it take for the amount to double?

25. You buy a new car for \$35,000. Five years later the car is worth \$17,951; assume a continuous rate of depreciation.

a) Write an exponential equation that models this situation.

b) Find when the car will have a value of \$9000.

26. The half-life of the radioactive isotope of zinc-71 is 2.4 minutes. If you started with 100.0 grams, how many would you have left at 7.2 minutes?



Trigonometry extra practice

No Calculator

1. Find a positive and negative coterminal angle to  $-570^\circ$ .

2. Given the point  $(3, -5)$ , find the six trigonometric functions of the  $\theta$  created at that point.

3. Find the point on the unit circle corresponding to  $\theta = -\frac{4\pi}{3}$ .

4. Given  $\sin \theta = \frac{5}{7}$  and  $\tan \theta > 0$ , find  $\sec \theta$ .

5. Find the exact value of a)  $\sec \frac{5\pi}{3}$

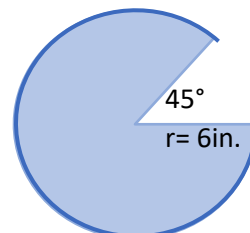
b)  $\tan \frac{7\pi}{4}$

c)  $\sin \frac{5\pi}{6}$

6. Find the angle in radians for a)  $\arctan(-\sqrt{3})$

b)  $\arccos\left(-\frac{1}{2}\right)$

7. Find the exact area for the shaded figure show.



8. Find an expression in  $x$  for  $\tan(\arccos x)$ .

9. Find the exact value:  $\sec\left(\arcsin\left(\frac{-2}{3}\right)\right)$

10. Determine the period and amplitude of the function:  $f(x) = 3 \cos \frac{x}{2}$ .

Graph at least one full period of the function and label both the  $x$  and  $y$  axis.

11. Graph the function:  $f(x) = 5 \sin\left(\frac{1}{2}(x + \pi)\right)$

12. Graph the function:  $f(x) = \sec 4x - 2$

13. Verify:  $1 + \frac{1}{\sec^2 x - 1} = \csc^2 x$

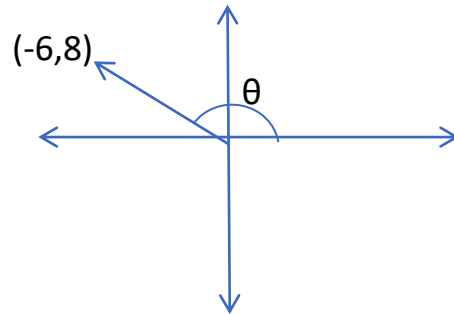
14. Verify:  $\left(\frac{\sin \theta}{1 + \cos \theta} + \frac{1 + \cos \theta}{\sin \theta}\right) = 2 \csc \theta$

15. Find all the solutions:  $\sin 2\theta = \cos \theta$

16. Find all solutions in  $[0, 2\pi)$ :  $3 \tan^2 2x - 1 = 0$

17. Find the exact values of sine, cosine and tangent of  $\frac{5\pi}{12}$ . (Using sum and difference formulas)

18. Use the drawing to find  $\cos \frac{\theta}{2}$  and  $\tan \frac{\theta}{2}$ :



Calculator allowed.

1. Convert  $\frac{8\pi}{35}$  to degrees. (Round to three decimals.)

2. Solve the right triangle given right angle at C, angle A =  $25^\circ$  and  $b = 10$ .

3. From a point on a cliff 80 feet above the water, an observer can see a ship at an angle of depression of  $4^\circ$ . How far is the ship from the base of the cliff?

4. An observer views the 984 feet tall Eiffel tower in the distance at angle of elevation of  $22^\circ$ . What distance has the observer walked if after 5 minutes of walking directly towards the Eiffel tower, the angle of elevation is now  $38^\circ$ .

5. At the fair, there is a Ferris wheel with a 45 feet radius. The seats start at the bottom at 3 feet off the ground and make a complete cycle in 10 seconds. Write a sinusoidal function that models the situation. Then use the equation to find the height at 6 seconds.

6. Given  $\cos \theta = -\frac{4}{7}$  and  $\sin \theta < 0$ , find the  $\sin 2\theta$  and  $\tan 2\theta$ .

7. Rewrite as a sum or difference:  $2\cos(3x)\cos(4x)$

8. Rewrite as a product and find the exact value:  $\sin(105) - \sin(75)$

9. A baseball leaves the hand of the player at first base at an angle of  $\theta$  with the horizontal and at an initial velocity of 60 feet per sec. The ball is caught by the player at second base 100 feet away. Find  $\theta$ , recalling the formula:  $r = \frac{1}{32} v_o^2 \sin 2\theta$

Solve the triangles: round all answers to two decimals. (Using law of sines and cosines)

10.  $a = 10$ ,  $b = 4$ , and  $A = 36^\circ$

11.  $a = 5$ ,  $b = 7$ , and  $C = 114.6^\circ$ .

12.  $A = 135^\circ$ ,  $b = 12$ ,  $c = 15$

13.  $a = 10$ ,  $b = 6$ ,  $c = 9$

14.  $A = 49^\circ$ ,  $B = 57^\circ$ ,  $a = 8$

15.  $a = 6$ ,  $b = 5$ , and  $B = 72^\circ$

16. In  $\triangle ABC$ ,  $a = 5$ ,  $b = 7$ , and  $c = 11$ . What is the measure of  $\angle B$ ?

**Solve. Round to the nearest tenth unless otherwise specified. (Finding area of a triangle)**

17. In  $\triangle ABC$ ,  $b = 10$ ,  $c = 23$ , and  $A = 132^\circ$ . Find the area of triangle ABC.

18. A surveyor measure the three sides of a triangular field and gets 114, 165, and 257 m. What is the measure (in degrees) of the largest angle of the triangle? and what is the area of the field?

Vectors: NO calculator

10. Given magnitude  $||AB|| = 10$  and direction angle of  $150^\circ$  find component form. (Leave exact)

11. Find the vector  $\vec{UV}$ , given that  $\mathbf{u} = (-2,4)$  and  $\mathbf{v} = (3,-1)$ , and then find the magnitude and direction of  $UV$ .

12. Find a unit vector for  $\vec{u} = \langle 3,-1 \rangle$ .

13. Find  $5\vec{u} - 3\vec{v}$ , given  $\vec{v} = \langle -2,4 \rangle$  and  $\vec{u} = \langle 3,-1 \rangle$ .

Calculator Allowed

14. Find the angle between  $\vec{u}$  and  $\vec{v}$ ,  $\vec{v} = \langle -2,4 \rangle$  and  $\vec{u} = \langle 3,-1 \rangle$ .

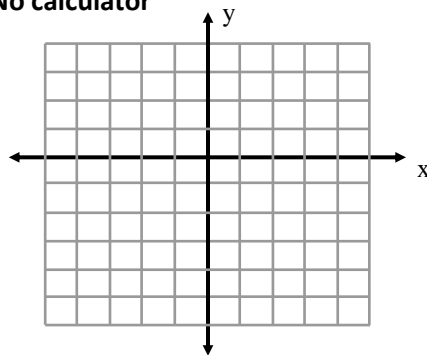
15. Are the following vectors orthogonal, parallel or neither?  $\vec{u} = \langle -2,4 \rangle$  and  $\vec{v} = \langle 3,-6 \rangle$

Systems of Equations and Matrices review: **No calculator**

1. Solve the system graphically:

$$x^2 + 2y = -6$$

$$x - y = 3$$



2. Solve by substitution:

$$x^2 + 2y = 6$$

$$2x + y = 3$$

3. Solve by elimination:

$$5x + 2y = -1$$

$$-15x + 8y = 10$$

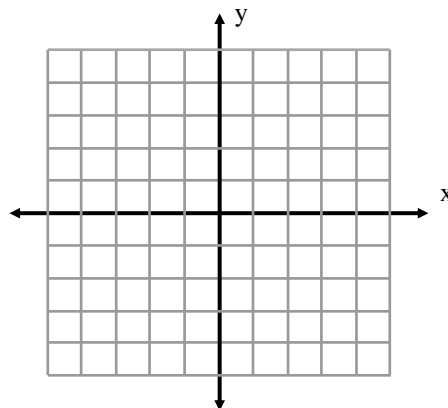
4.

Classify the system  $\begin{cases} -7x - 6y = 4 \\ -28x - 24y = 16 \end{cases}$ , and determine the number of solutions.

- This system is dependent. It has infinitely many solutions.
- This system is inconsistent. It has no solutions.
- This system is consistent it has one solution

5. Sketch a graph of the system of inequalities and shade the solution.

$$\begin{cases} x^2 + y^2 \leq 25 \\ x \leq 3 \\ y > -4 \end{cases}$$





6. Determine the order (size) of the following matrix  $A = \begin{bmatrix} -4 & 0 \\ 1 & -5 \\ -3 & 2 \end{bmatrix}$ .

7. Write the augmented matrix for the system  $\begin{cases} x+y=8 \\ z-y=4 \\ x=z+3 \end{cases}$ .

8. Add.

$$\begin{bmatrix} 4 & -7 & 4 \\ 8 & 7 & -4 \end{bmatrix} + \begin{bmatrix} 6 & 2 & 1 \\ -9 & 4 & 0 \end{bmatrix}$$

9. Given  $A = \begin{bmatrix} -4 & 0 \\ 1 & -5 \\ -3 & 2 \end{bmatrix}$  and  $B = \begin{bmatrix} 1 & 2 \\ -2 & 1 \\ 4 & 4 \end{bmatrix}$ : Find  $4A + 3B$ .

10. Given  $A = \begin{pmatrix} 2 & -1 \\ 4 & -3 \end{pmatrix}$ , find the determinant of matrix A.

11. Tell whether the product of  $P_{7 \times 5}$  and  $Q_{5 \times 3}$  is defined. If so, give the dimensions of  $PQ$ .
- |                          |                          |
|--------------------------|--------------------------|
| a. defined; $5 \times 5$ | c. defined; $3 \times 7$ |
| b. defined; $7 \times 3$ | d. undefined             |

12. Find the partial fraction decomposition:  $\frac{9x-2}{x^2-x-6}$

Calculator Allowed

1. The perimeter of a rectangle is 88 feet and the length is 9 feet more than  $\frac{2}{5}$  times the width.

Find the dimensions of the rectangle.

2. Using this system 
$$\begin{cases} -x - 4y + 3z = 6 \\ 6x + 5y - 6z = -19 \\ 3x - 6y + 9z = 18 \end{cases}$$
 determine the number of solutions.

- a. One solution.
- b. Infinitely many solutions.
- c. No solutions.

3. Solve:

$$\begin{aligned} x + 3y + z &= 0 \\ 5x - y + z + w &= 0 \\ 2x + 2z + w &= 2 \\ 3x + 2z - w &= 10 \end{aligned}$$

4. Given  $A = \begin{bmatrix} -4 & 0 \\ 1 & -5 \\ -3 & 2 \end{bmatrix}$  and  $B = \begin{bmatrix} 1 & 2 \\ -2 & 1 \end{bmatrix}$ : Find  $AB$ .

5. Find the determinant of the following 
$$\begin{vmatrix} 4 & 7 & -1 \\ 2 & -3 & 4 \\ -5 & 1 & -1 \end{vmatrix}.$$

6. Ann invested \$12,000 in two bank accounts. One of the accounts pays 6% annual interest, and the other account pays 5% annual interest. If the combined interest earned in both accounts after a year was \$700, how much money was invested in each account?

7. A homeless shelter used a generous donation to purchase items worth a total of \$2,200. Blankets cost \$5 each, a pair of boots cost \$20 each, and coats cost \$25 each. There are 7 blankets for every coat, and twice as many pairs of boots as coats. Solve by using row reduction on a calculator. How many of each item were purchased?

8. Find the minimum and maximum values of the objective function:  $z = 5x + 2y$  given the following constraints:  $x \geq 0$ ;  $y \geq 0$ ;  $\frac{1}{2}x + y \leq 8$ ;  $x + \frac{1}{2}y \geq 4$

9. Find the partial fraction decomposition:  $\frac{-5x^2 - 19x - 28}{x^3 + 4x^2 + 4x}$

Series and Sequence, and Probability Review

1. Write a formula for the sequence  $\{-16, 8, -4, 2, \dots\}$

2. Write the series using sigma notation:  $(-1) + 4 + (-9) + 16 + (-25)$

3. Simplify  $\frac{(x+1)!5!}{(x-1)!6!}$

4. Which is the correct recursive formula for the sequence?

$\{6, 10, 14, 18, \dots\}$

a.  $u_1 = 4; u_n = u_{n-1} + 4$

c.  $u_1 = 26; u_n = u_{n-1}$

b.  $u_1 = 14; u_n = u_{n-1} - 26$

d.  $u_1 = 6; u_n = u_{n-1} + 4$

5. Select the correct description of the sequence:

$\{5, 8, 11, 14, 17, \dots\}$

a. Arithmetic with  $d = 8$

c. Arithmetic with  $d = 3$

b. Arithmetic with  $d = 11$

d. Not arithmetic

6. Determine whether the sequence is arithmetic, geometric, or neither.

$6, 3, 0, -3, -6, \dots$

a. neither

b. geometric

c. arithmetic

7. Find the sum of  $\sum_{n=2}^6 5n - 3$ .

8. Find  $a_9$  for the arithmetic sequence  $-7, -3, 1, 5, \dots$

For 9-11, find the sum of  $n$  terms for each arithmetic series described.

9.  $a_1 = 43, n = 19, a_n = 115$

10.  $a_1 = 25, d = -3, n = 21$

11.  $16 + 10 + 4 + \dots + (-44)$

For 12-16, find the sum for each **geometric series** described.

12.  $324 - 108 + 36 - \dots$ ,  $n = 6$

13.  $a_2 = 36$ ,  $a_5 = 972$ ,  $n = 7$

14.  $\frac{5}{3} + \frac{25}{3} + \frac{125}{3} + \dots$

15.  $\sum_{n=2}^7 2(3)^{n-1}$

16.  $\sum_{k=1}^{\infty} 8(-0.5)^{k-1}$

**Solve. Be sure to include units with all answers!**

17. A display in a grocery store has 1 can on the top row, 2 cans on the 2<sup>nd</sup> row, 3 cans on the 3<sup>rd</sup> row, and so on. How many cans are needed to make 30 rows?

18. A pile driver drives a post 8 feet into the ground on its first hit. Each additional hit drives the post  $\frac{3}{4}$  the distance of the prior hit.

a. To find the total distance after  $n$  hits, would you use an arithmetic series or geometric series?

b. Find the **total** distance the post has been driven after 4 hits.

c. What is the maximum distance the post will go?

19. Tommy chooses a different toy out of his toy box each day. If he has 21 different toys in his toy box. Over 5 days, how many ways can Tommy choose his toys?
20. Expand  $(3x - y)^4$
21. What is the 6<sup>th</sup> term of  $(2x - 3y)^{10}$
22. How many ways can the letters in DEPENDENT be arranged?
23. A store has 12 sofas, 15 lamps, and 6 tables at half price. How many different ways can one sofa, lamp and table be bought at the sale?
24. How many ways can 6 children form a line to use the drinking fountain?
25. From a group of 7 men and 5 women, a committee of 4 is to be formed. How many committees of 3 men and 1 woman can be formed?
26. How many ways can 3 identical pen sets and 5 identical watches be given to 8 graduates if each receives one item?
27. How many seven-digit phone numbers can be formed if the first digit is 2, the last digit is 0, and none of the digits repeat?
28. Teresa and Julia are among 10 students who have applied for a trip to Washington, D.C. Two students from the group will be selected at random for the trip. What is the probability that Teresa and Julia will be the 2 students selected?

Polar and Parametric review

No Calculator

1. Graph polar point and find another polar representation of that point.

a)  $(2, \frac{4\pi}{3})$

b)  $(-3, -\frac{\pi}{4})$

2. Given a rectangular point (1, -1) convert to polar.

3. Given a polar point  $(3, \frac{4\pi}{3})$  convert to rectangular.

4. Write this equation in rectangular form:  $r = 3\cos\theta$

5. Given parametric equations  $x = 3t$  and  $y = t^2 + 2t$ , find the point in rectangular form at  $t = 2$ .

6. Eliminate the parameter and obtain a rectangular equation.

$$x = 4t^2 + 5 \quad y = t - 3$$

7. Write a set of parametric equations for the given rectangular equation.  $x^2 + y^2 = 121$

Calc Allowed

1. Sketch a graph for the following: a)  $r = 1 + 3 \cos\theta$                       b)  $r = 4 \sin 2\theta$

2. Graph the following parametric equations: (Use  $T_{\min}=0$ ,  $T_{\max}=2\pi$ , and zoom decimal)

$$X_3 = 0.5\cos(0.5t)$$

$$Y_3 = -0.5 - 0.5\sin(0.5t)$$

$$X_4 = 2\cos(t)$$

$$Y_4 = 2\sin(t)$$

Use these complex numbers for Questions 6-9,  $z_1 = 2 - 3i$  and  $z_2 = -1+5i$

9. Change  $z_1$  and  $z_2$  to trigonometric form.

10. Divide  $\frac{z_1}{z_2}$  and write your answer in standard form  $(a+bi)$ .

11. Find  $(z_2)^4$

12. Find  $\sqrt[4]{z_1}$