

DO NOT TURN THIS PAGE UNTIL YOU ARE INSTRUCTED TO DO SO

- ❖ Write your name below on the space provided.
- ❖ This test has a total of 7 pages.
- ❖ Work the problem in the space provided. If you need more space, write on the back of the test.
- ❖ To insure maximum credit, show your work. In general, full credit will not be given for unsupported answers.
- ❖ Look only at your test. Don't give me the impression that you are cheating.
- ❖ Nope, no extra credit on this page. Wah wahhhh. But, thanks for reading directions.
- ❖ Be sure to write neatly. If I cannot read what was written, do not expect the problem to be graded. A pencil must be used on all tests. Otherwise, the test will not be graded.
- ❖ If you finish early, go over the test again.

Good luck!

Number	Maximum	Score
1	6	
2	3	
3	6	
4	9	
5	6	
6	10	
7	3	
8	8	
9	8	
10	3	
11	6	
12	12	
13	8	
14	4	
15	4	
16	4	
Total	100	

Name _____

Circle Final Answers

Feel free to tear off the last sheet. I do not need it returned.

1) (5 points) Fill in the information for the parabola $(x + 4)^2 = -12(y + 1)$:

i) $h =$ _____

ii) $k =$ _____

iii) $p =$ _____

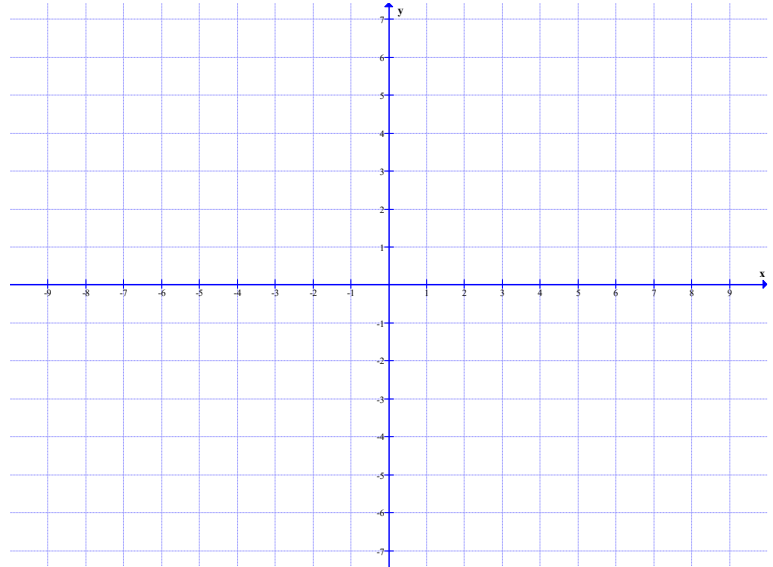
Write iv and v as ordered pairs:

iv) Center _____

v) Focus _____

vi) Directrix _____

vi) Sketch the graph:



2) (3 points) Determine the location of the receiver for a 30 foot tall, 6 foot deep parabolic satellite dish assuming the receiver is to be at installed at the foci of the parabola. Give your answer in feet from the vertex of the dish:

3) (3 points each) Statuary Hall, also known as the Whispering Gallery, is an elliptical room in the United States Capitol in Washington D.C. where a person standing at one focus of the room can hear even a whisper spoken by a person standing at the other focus. Statuary Hall is 46 feet wide and 97 feet long. Assuming a horizontal ellipse, find...

a) The equation of the ellipse for the room:

b) The location of the foci from the center of the room. Round to two decimal places:

4) (3 points each) For the ellipse $25x^2 - 100x + 16y^2 + 96y + 244 = 400$

a) Rewrite the equation by completing the square for both variables:

b) Find the **exact values** for the following:

i) $h =$ _____

ii) $k =$ _____

iii) $a =$ _____

iv) $b =$ _____

v) $c =$ _____

Write as ordered pairs:

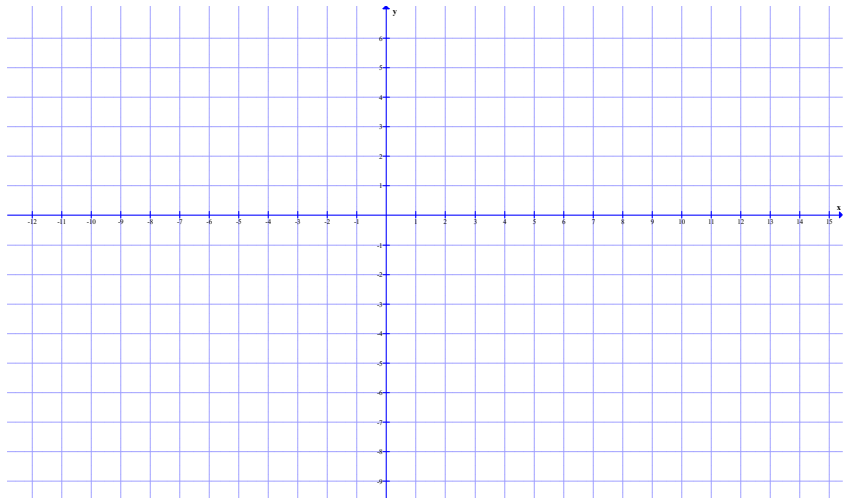
vi) Center _____

vii) Vertices _____

viii) Co-Vertices _____

ix) Foci _____

c) Sketch the graph:



5) (6 points) Fill in the information for the hyperbola $\frac{y^2}{9} - \frac{x^2}{16} = 1$:

i) $h =$ _____

ii) $k =$ _____

iii) $a =$ _____

iv) $b =$ _____

v) $c =$ _____

Write as ordered pairs:

vi) Center _____

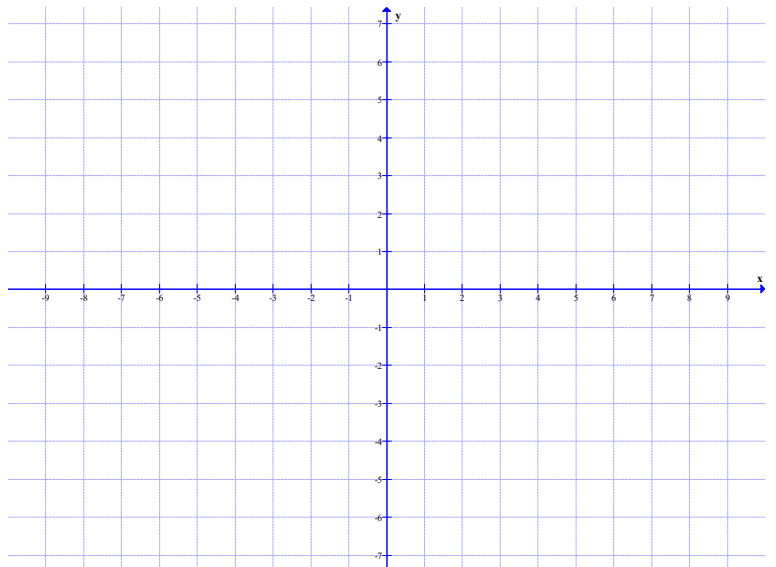
vii) Vertices _____

viii) Co-Vertices _____

ix) Foci _____

x) Asymptotes _____

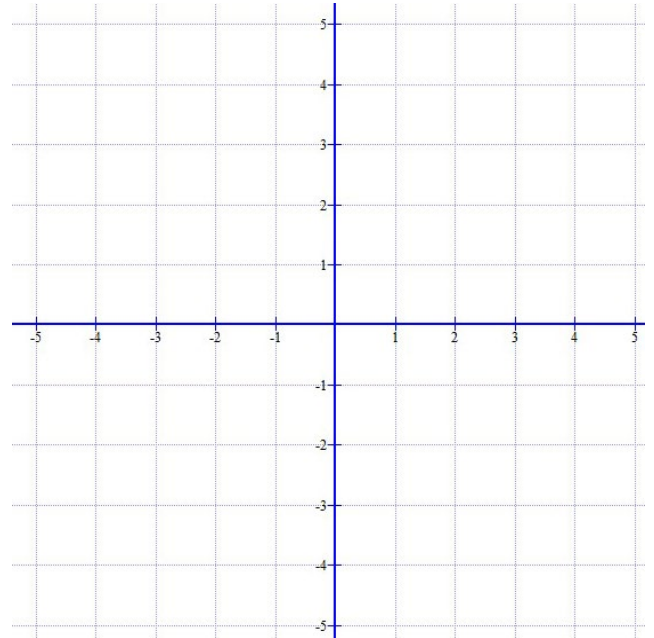
vi) Sketch the graph:



6) (5 points each) Solve the following systems. For part *b*, shade your final in the darkest:

a)
$$\begin{cases} xy = -8 \\ x + 3y = -10 \end{cases}$$

b)
$$\begin{cases} x^2 + y^2 \leq 16 \\ \frac{y^2}{9} - \frac{x^2}{4} \leq 1 \end{cases}$$



7) (3 points) What is a sequence?

8) (4 points each) Find the first four terms of the following sequences using fractions as necessary. Determine if they are arithmetic, geometric, or neither. If it is arithmetic, determine the common difference. If it is geometric, determine the common ratio.

a) $\{5n - 2\}$

b) $a_1 = 27, a_{n+1} = \frac{2}{3}a_n, n \geq 1$

9) (4 points each) Given the sequence below, find the general term a_n . For part *a* **only**, use the formula $a_n = a_1 + (n-1)d$ and simplify:

a) 8, 5, 2, -1, ...

b) $\frac{1}{\sqrt{2}}, \frac{\sqrt{2}}{\sqrt{3}}, \frac{\sqrt{3}}{2}, \frac{2}{\sqrt{5}}, \frac{\sqrt{5}}{\sqrt{6}}, \dots$

10) (3 points) Find the sum $\sum_{k=5}^8 (-1)^k \cdot k^2$. Be sure to write out the individual terms:

11) (3 points each) Write the follow series in sigma notation. Refer to problem 9:

a) $8 + 5 + 2 + (-1) + \dots + (-28)$

b) $\frac{1}{\sqrt{2}} + \frac{\sqrt{2}}{\sqrt{3}} + \frac{\sqrt{3}}{2} + \frac{2}{\sqrt{5}} + \frac{\sqrt{5}}{\sqrt{6}} + \dots + \frac{7}{\sqrt{50}}$

12) (4 points each) A 50-foot long parking lot is to be painted so that it contains 5 equal-width parking spots. The right-most spot is designated for handicap only and will be flanked by a 2-foot wide line on each side to allow for the doors to open fully. The other 4 spots will be separated by a $\frac{1}{2}$ foot wide line. There is no line drawn at the left edge of the parking lot.

a) Draw a picture for this scenario:

b) How wide is each of the 5 parking spots?

c) Starting your count from the left-most edge of the parking lot, determine the location of the left-edge of the $\frac{1}{2}$ foot wide lines:

13) (4 points each) Evaluate the sums using either formula: $S_n = \frac{n}{2}(2a_1 + (n-1)d)$ or $S_n = \frac{n}{2}(a_1 + a_n)$.

Write answers as improper fractions as needed:

a) $\sum_{k=1}^{500} (10k + 2)$

b) $\sum_{k=42}^{58} \left(\frac{2k-1}{6} \right)$

14) (4 points) Short answer: Why can't you find an infinite sum of terms of an arithmetic sequence, but you can under certain constrictions of a geometrics sequence.

15) (4 points) Find the sum $1 + \frac{2}{3} + \frac{4}{9} + \frac{8}{27} + \dots + \frac{128}{2187}$ using $S_n = a_1 \frac{1-r^n}{1-r}$. You may need to refer to number 9. Write answer as an improper fraction using MATH > FRAC on your calculator:

16) (4 points) Gilberto's daughter tosses the pony she's always wanted as a child off of a 120 foot cliff. Thankfully, the pony is made of rubber and bounces gleefully, rebounding $\frac{4}{5}$ of the distance fallen. How far vertically does the pony travel? Use the formula $S_\infty = \frac{a_1}{1-r}$ in your answer.

FORMULAS

Parabola

Vertical:

$$x^2 = 4py \quad (x-h)^2 = 4p(y-k)$$

Horizontal:

$$y^2 = 4px \quad (y-k)^2 = 4p(x-h)$$

Ellipse

Horizontal:

$$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1 \quad \frac{(x-h)^2}{a^2} + \frac{(y-k)^2}{b^2} = 1$$

Vertical:

$$\frac{x^2}{b^2} + \frac{y^2}{a^2} = 1 \quad \frac{(x-h)^2}{b^2} + \frac{(y-k)^2}{a^2} = 1$$

Foci:

$$a^2 - b^2 = c^2$$

Hyperbola

Horizontal:

$$\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1 \quad \frac{(x-h)^2}{a^2} - \frac{(y-k)^2}{b^2} = 1$$

Vertical:

$$\frac{y^2}{a^2} - \frac{x^2}{b^2} = 1 \quad \frac{(y-k)^2}{a^2} - \frac{(x-h)^2}{b^2} = 1$$

Foci:

$$a^2 + b^2 = c^2$$