

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. Feel free to tear off the last page.
- ❖ 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.
- ❖ No extra credit here. Wah wahhhh.
- ❖ 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	4	
3	6	
4	8	
5	10	
6	2	
7	12	
8	4	
9	8	
10	6	
11	8	
12	8	
13	6	
14	8	
15	4	
Total	100	

Name _____

Circle Final Answers

1) (6 points) Fill in the information for the parabola $(x - 4)^2 = 8(x + 1)$:

i) $h =$ _____

ii) $k =$ _____

iii) $p =$ _____

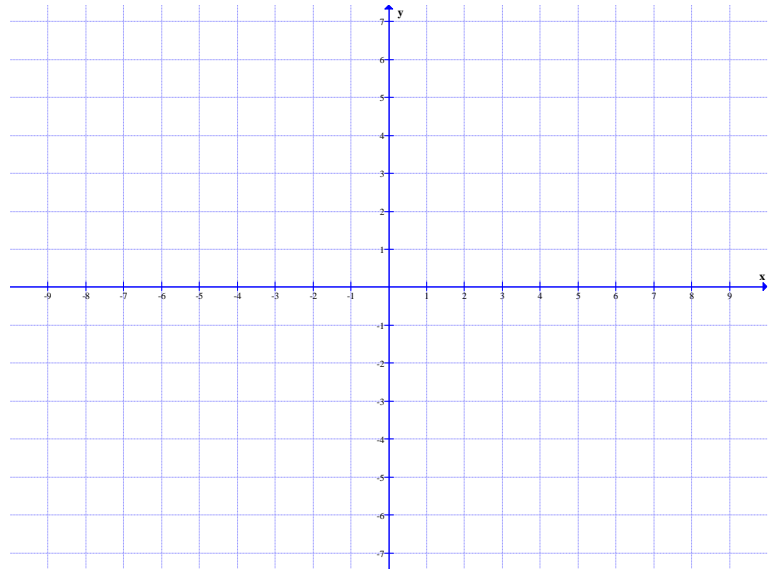
Write iv and v as ordered pairs:

iv) Vertex _____

v) Focus _____

vi) Directrix _____

vi) Sketch the graph:



2) (4 points) While on stage, Mike notices that the spotlight on him has a parabolic mirror that is 4 feet wide and 1.5 feet deep. If the bulb for the spotlight is at the focus of the parabola, how far, in inches, from the vertex of the parabola is the bulb located?

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) (8 points) Fill in the information for the hyperbola $\frac{y^2}{25} - \frac{x^2}{144} = 1$:

i) $h =$ _____

ii) $k =$ _____

iii) $a =$ _____

iv) $b =$ _____

v) $c =$ _____

Write as ordered pairs:

vi) Center _____

vii) Vertices _____

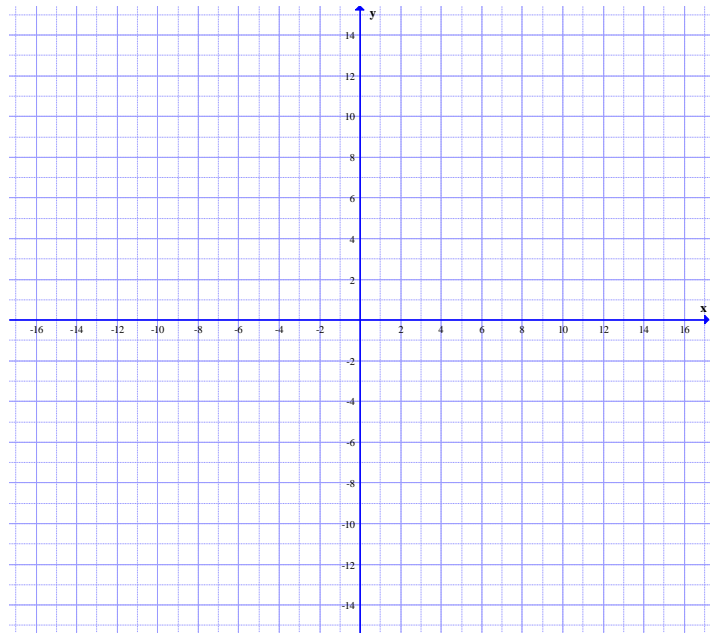
viii) Co-Vertices _____

ix) Foci _____

Write in slope-intercept form:

x) Asymptotes _____

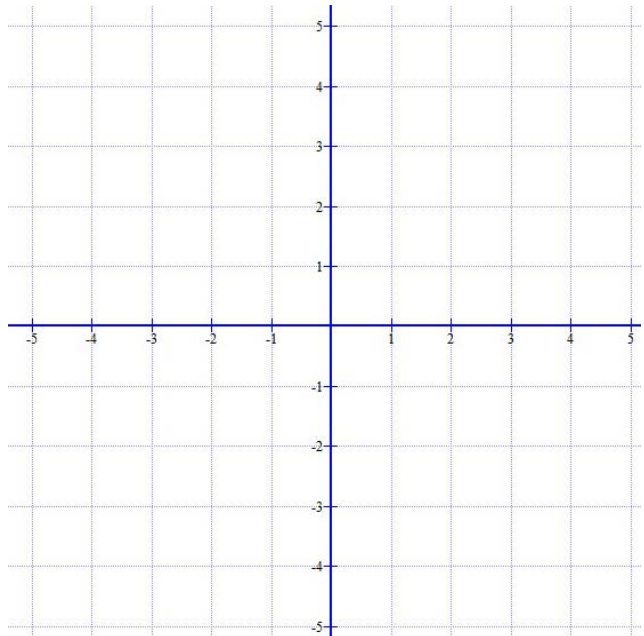
vi) Sketch the graph:



5) (5 points each) Solve the following systems. For part *a*, write your answer in ordered pairs. For part *b*, shade your final in the darkest:

a)
$$\begin{cases} 4x^2 + y^2 = 16 \\ x^2 - y^2 = 4 \end{cases}$$

b)
$$\begin{cases} x^2 + y^2 \geq 9 \\ \frac{x^2}{25} + \frac{y^2}{4} \leq 1 \end{cases}$$



6) (2 points) What is a sequence?

7) (6 points each) Find the first five terms of the following sequences. 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) $\{2(-3)^n\}$

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

8) (4 points) Find the sum $\sum_{k=1}^6 \frac{k}{3}$. Be sure to write out the individual terms:

9) (4 points each) Write in sigma notation:

a) $\frac{1}{2} + \frac{2}{3} + \frac{3}{4} + \frac{4}{5} + \dots + \frac{49}{50}$

b) $1 - \frac{1}{4} + \frac{1}{16} - \frac{1}{64} + \dots + \frac{1}{4,096}$

10) (3 points each) For the arithmetic sequence $-4, -1, 2, 5, 8, \dots$, find and simplify...

a) a_n using $a_n = a_1 + (n-1)d$

b) a_{412} :

- 11) (4 points each) Mike decides to hang some photos of his favorite pies on a 40 foot wall in his office. The 5 frames are 4 feet long each. He wants the first and last frames to be in from the corner by 2 feet and equal spacing in between each frame.
- a) Draw a complete picture for this scenario:

- b) Assuming the nails will go in the exact horizontal center of the frame, where should Mike put the nails into the wall? Start your count from the left corner:

- 12) (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) $\sum_{k=1}^{70} (4x-10)$

b) $\sum_{k=12}^{48} \left(\frac{5k+10}{4} \right)$

- 13) (3 points each) For the geometric sequence $\frac{2}{9}, \frac{2}{3}, 2, 6, \dots$, find the following given $a_n = a_1 r^{n-1}$:

a) a_n

b) a_{15}

14) (4 points each) Using the formulas $S_n = a_1 \frac{1-r^n}{1-r}$ and $S_\infty = \frac{a_1}{1-r}$ (respectively), find by writing answers as an improper fraction...

a) $8 + 2 + \frac{1}{2} + \frac{1}{8} + \dots + \frac{1}{128}$

b) $8 + 2 + \frac{1}{2} + \frac{1}{8} + \dots$

15) (4 points) A ball is dropped from a height of 80 feet and always rebounds $\frac{1}{2}$ of the distance fallen. How far does the ball travel vertically before coming to a stop? In your answer be sure to use the formula $S_\infty = \frac{a_1}{1-r}$.

Formulas

Parabola

Vertical: $x^2 = 4py$ $(x-h)^2 = 4p(y-k)$

Horizontal: $y^2 = 4px$ $(y-k)^2 = 4p(x-h)$

Ellipse

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

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

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

Hyperbola

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

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

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