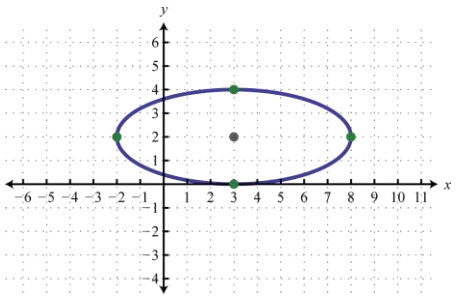
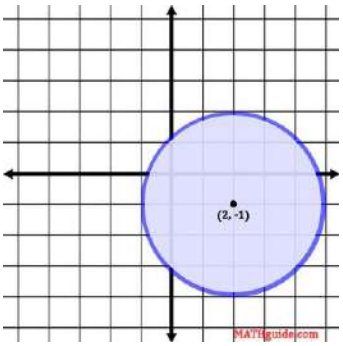
Math III – Spring Final Exam Name _____**KEY**_____ Period _____
STUDY GUIDE

1. Write the equation of the ellipse.



$\frac{(x-3)^2}{25} + \frac{(y-2)^2}{4} = 1$

2. Write the equation of the circle.



$(x-2)^2 + (y+1)^2 = 1$

3. Find the length of the major axis (distance between the vertices) of the ellipse $\frac{(x-3)^2}{16} + \frac{(y+3)^2}{25} = 1$.

ten

4. What are the slopes of the asymptotes of the hyperbola $\frac{(y+3)^2}{4} - \frac{(y-2)^2}{16} = 1$?

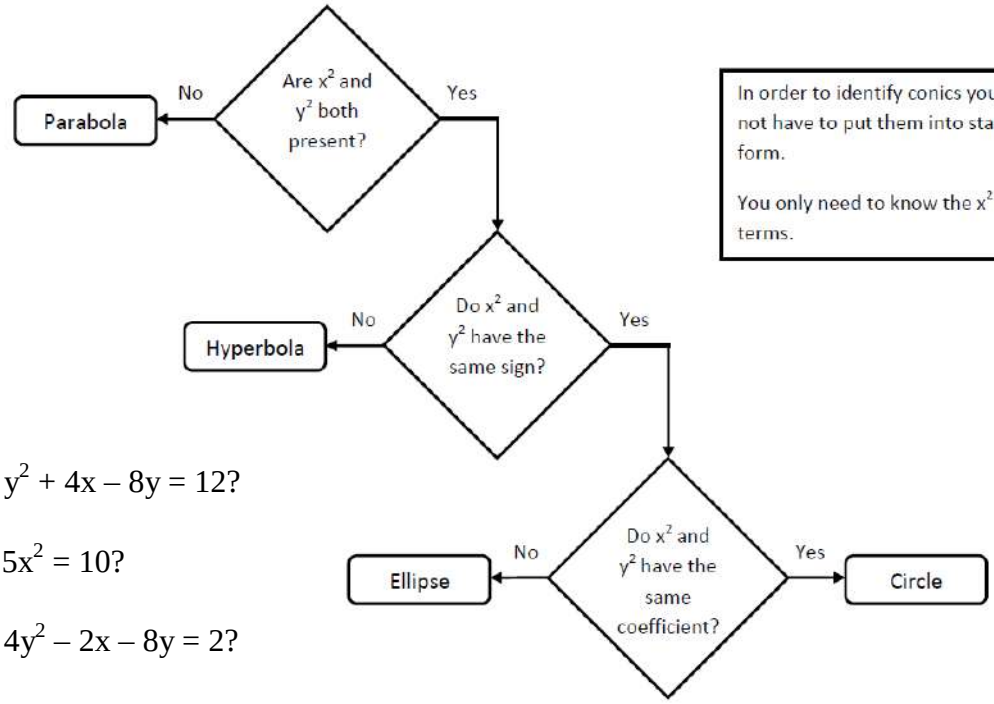
± ½

For exercises 5 & 6, refer to the parabola $y + 2 = -\frac{1}{16}(x+4)^2$

5. Find the coordinate of the vertex. **(-4, -2)**

6. Which way does the parabola open? **down**

For exercises 7-9, use the flowchart to help determine the conic section.



7. What is the graph of $x^2 + y^2 + 4x - 8y = 12$?

circle

8. What is the graph of $y^2 - 5x^2 = 10$?

hyperbola

9. What is the graph of $x^2 + 4y^2 - 2x - 8y = 2$?

ellipse

10. Find the missing term in the perfect square trinomial (*Hint: completing the square*).

$(x-7)^2 = x^2 - 14x\_ + \mathbf{49}\_\_$

11. Write $x^2 - 6x + y^2 - 12y = 4$ in standard form. $\boldsymbol{(x-3)^2 + (y-6)^2 = 49}$

12. Graph $(x+3)^2 + (y-2)^2 = 16$ ***(draw a circle with center at (-3,2) and a radius of 4)***

13. Draw a line tangent to the circle graphed in problem #12 above. Label the coordinates of your point of tangency. ***(draw a line that touches the circle at only 1 point… label that point of intersection)***

14. Write the standard form of the equation of the **ellipse** with vertices at (4, ± 6), and whose minor axis is 4 units long. $\boldsymbol{\frac{(x-4)^2}{4} + \frac{(y)^2}{36} = 1}$

15. Name the different conic sections. **circle, ellipse, hyperbola, parabola**

16. Complete the square and then find the coordinates of the center for the ellipse represented by the equation $\boldsymbol{4x^2 + 9y^2 - 48x + 72y + 144 = 0}$

$\boldsymbol{4x^2 - 48x + 9y^2 + 72y = -144}$

$\boldsymbol{4(x^2 - 12x + 36) + 9(y^2 + 8y + 16) = -144 + 4(36) + 9(16)}$

$\boldsymbol{4(x-6)^2 + 9(y+4)^2 = 144}$

$\boldsymbol{\frac{(x-6)^2}{36} + \frac{(y+4)^2}{16} = 1}$ **Center (6, -4)**

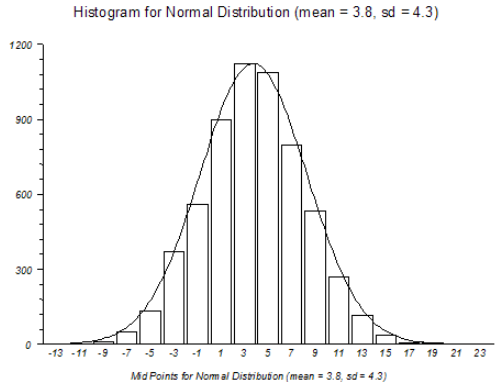
17. Which is the equation of a sphere with center at (-5, -1, 3) and radius of 4.

$\boldsymbol{(x+5)^2 + (y+1)^2 + (z-3)^2 = 16}$

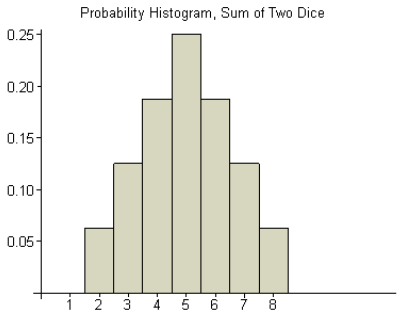
18. In a normal distribution curve, what percent of the total is within two standard deviations of the mean?

95%

19. Draw a histogram that would be best approximated by a normal distribution curve.



20. This probability histogram shows the distribution for a random variable X. What is the probability that X is at most 4?



(add the probabilities for 1 through 4)

$\boldsymbol{0 + 0.06 + 0.12 + 0.19 = 0.37}$

21. What is the percent of the area under a normal curve between $X - 1\sigma \; and \; X + 3\sigma$?

67.85%

22. What is the mean and standard deviation of a normal distribution that approximates the binomial distribution with 40 trials and a probability of success on each trial of 0.30?

(Hint: μ = np and σ = $\sqrt{np(1-p)}$ **μ = 12** $\boldsymbol{\sigma = 2.90}$

23. Sarah receives a grade of 80 out of 100 on her Math III final exam. If the mean of the class grades is 75 with a standard deviation of 8, what is the z-score of Sarah's grade?

$$\boldsymbol{z = \frac{X-\mu}{\sigma} = \frac{80-75}{8} = .63}$$

24. What is the difference between an experimental and observational study?

An experiment uses treatments and randomization; observational does not

25. Name the measures of central tendency and the measure of spread.

Measures of central tendency – mean, median, mode
Measure of spread – standard deviation

26. Create a histogram for the following probability distribution.

X	1	3	7	10
P(x)	0.15	0.25	0.4	0.2

(draw the histogram based on the table above)

27. Suppose *X* is binomial with *n* = 6 and *p* = 1/4. What is the probability that *X* is either 0 or 1?

$$\boldsymbol{binomCdf(6, .25, 0, 1) = 0.5339}$$

For exercises 28 and 29, a set of 500 values has a normal distribution with a mean of 80 and a standard deviation of 10.

28. Approximately, what percent of the data is between 67 and 85?

$$\boldsymbol{normCdf(67, 85, 80, 10) = 0.5947}$$

29. Find the probability that a value selected at random from this data is between 75 and 85.

$$\boldsymbol{normCdf(75, 85, 80, 10) = 0.3829}$$

30. What is P(z > 0)? **0.5000**

For exercise 31, let the random variable X represent the gross sales made on a randomly selected day by a certain store. Assume X is normal with a mean of $960 and a standard deviation of $80.

31. Referring to the information above, find the value of *P*(*X* > $1000).

$$\boldsymbol{normCdf(1000, 1000000, 960, 80) = 0.3085}$$

For exercises 32 and 33, a survey asks a random sample of 2500 adults in Georgia if they support an increase in the state sales tax from 7% to 8%, with the additional revenue going to education. Let X denote the number in the sample that say they support the increase. Suppose that 40% of all adults in Ohio support the increase. (Hint: Use $\mu = np$ and $\sigma = \sqrt{np(1-p)}$).

32. Calculate the mean. $\boldsymbol{\mu = 2500 \cdot 0.40 = 1000}$

33. Calculate the standard deviation. $\boldsymbol{\sigma = \sqrt{2500 \cdot 0.4 \cdot (1 - 0.4)} = 24.49}$

34. Using the laws of logarithms, condense $4\log_5 x + 3\log_5 z$ $\boldsymbol{\log_5(x^4 z^3)}$

35. Expand $\log_4\left(\frac{7}{2}\right)$ using the laws of logarithms. $\boldsymbol{\log_4 7 - \log_4 2}$

36. Using the laws of logarithms, condense: $\frac{1}{2}\log_4 9 - \log_4 5 - 2\log_4 6$ $\boldsymbol{\log_4\left(\frac{9^{1/2}}{5 \cdot 6^2}\right)}$

37. Using the laws of logarithms, expand: $\log_9 \frac{xz^4}{y^3}$ $\boldsymbol{\log_9 x + 4\log_9 z - 3\log_9 y}$

38. Divide. $(x^3 + 2x^2 - 6x + 3) \div (x - 1)$ $\boldsymbol{x^2 + 3x - 3}$ **(*show your work!)***

39. Divide. $(x^3 + 5x^2 - 6) \div (x - 1)$ $\boldsymbol{x^2 + 6x + 6}$ ***(remember the placeholder)***

40. List the possible roots of $f(x) = 3x^3 + 6x^2 - 8x - 8 = 0$. $\boldsymbol{\{\pm 1, \pm 2, \pm 4, \pm 8, \pm\frac{1}{3}, \pm\frac{2}{3}, \pm\frac{4}{3}, \pm\frac{8}{3}\}}$

41. Use the remainder theorem to evaluate $f(x) = x^3 - 20$ *at* $x = 3$. $\boldsymbol{f(3) = 7}$

42. Find the zeros (roots): $f(x) = x^3 - 3x^2 + 4x - 12$. $\boldsymbol{(3, 0)}$ **– graph it!**

43. Find the zeros (roots): $f(x) = x^4 - x^2 - 6$. $\boldsymbol{(1.73, 0)\ and\ (-1.73, 0)}$

44. If -3 and $(7 - \sqrt{2})$ are two of the roots of a 3rd degree polynomial with integer coefficients, which of the following is the other root? $\boldsymbol{7 + \sqrt{2}}$

45. If $-2 + \sqrt{2}$ and $3i$ are two of the roots of a 4th degree polynomial with integer coefficients, which of the following are the other roots? $\boldsymbol{-2 - \sqrt{2}, -3i}$

Define the following:

46. bias ***- a partiality (or opinion) that prevents objective consideration of an issue or situation***

47. explanatory variable - ***the general category for the independent variable (which determines the response variable)***

48. histogram - ***a graph of vertical bars representing the frequency distribution of a set of data***

49. convenience sampling - ***Create a sample by using data from population that is readily available.***

50. Mean - ***the average of a distribution, obtained by adding the scores and then dividing by the number of scores***

51. standard deviation - ***a measure of how much scores vary from the mean/ average***

52. treatment - ***a specific experimental condition applied to the experimental unit***

53. systematic random sampling - ***A sample in which each member of the population is assigned a number. The members of the population are ordered in some way and then sample members are selected at regular intervals.***

54. Treatment - ***a specific experimental condition applied to the experimental unit***

55. cluster sampling - ***member of a population are grouped together and then entire groups are chosen for sampling***

56. response variable - ***a variable that measures an outcome or result of a study***