

Answer each non-graph question neatly on the line provided.
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Name: \_\_\_\_\_

1. (5 points) Find the range of  $f(x) = -x^2 - 6x$ . Express your answer in interval notation.

1. \_\_\_\_\_

2. (5 points) Find the maximum or minimum value of  $f(x) = x^2 - 6x + 3$ .

2. \_\_\_\_\_

3. (5 points) Find the remainder after performing the division  $\frac{x^2-3x+7}{x-2}$ .

3. \_\_\_\_\_

4. (5 points) True or False:  $\frac{\log A}{\log B} = \log A - \log B$  for every  $A > 0$  and  $B > 0$ .

4. \_\_\_\_\_

5. (5 points) Evaluate  $\log_2(144) - \log_2(18)$ . Simplify your answer completely.

5. \_\_\_\_\_

6. (5 points) Solve  $1 + \log_3(x + 1) = -3$  for  $x$ .

6. \_\_\_\_\_

7. (5 points) Solve  $\frac{10}{1+e^{-x}} = 2$  for  $x$ . You may leave  $\ln$  in your answer.

7. \_\_\_\_\_

8. (5 points) This question uses the population growth model. A culture of bacteria starts at 4000 bacteria. After one hour the count is 5000. How many hours will the number of bacteria double?

8. \_\_\_\_\_

9. (5 points) Evaluate  $\tan\left(-\frac{5\pi}{6}\right)$ .

9. \_\_\_\_\_

10. (5 points) Find the terminal point on the unit circle determined by  $t = \frac{-3\pi}{4}$ .

10. \_\_\_\_\_

11. (5 points) Find the degree measure of the angle  $-\frac{5\pi}{2}$  radians.

11. \_\_\_\_\_

12. (5 points) Find  $\tan \theta$  if  $\sin \theta = -\frac{12}{13}$  and  $\theta$  is in quadrant IV.

12. \_\_\_\_\_

13. (5 points) The point  $P$  is on the unit circle, the  $x$ -coordinate of  $P$  is  $-\frac{2}{7}$ , and  $P$  is in quadrant II. Find the point  $P(x, y)$ .

13. \_\_\_\_\_

14. (5 points) Find an angle between 0 and  $2\pi$  that is coterminal with  $\frac{51\pi}{2}$ .

14. \_\_\_\_\_

15. (6 points) Sketch the graph  $y = 4 + \left(\frac{1}{3}\right)^x$  not by plotting points but by transforming a known graph. Label all intercepts and asymptotes on your sketch. State the domain and range using interval notation.

16. (6 points) Sketch the graph  $y = \log_6(x + 1)$  not by plotting points but by transforming a known graph. Label all intercepts and asymptotes on your sketch. State the domain and range using interval notation.

17. (6 points) Use long division and transformation to sketch the graph  $f(x) = -\frac{x}{x-8}$ . State the domain and range using interval notation.

18. (6 points) Sketch the graph  $f(x) = -x^4 + 9x^2$ . Label all intercepts on your sketch and describe its end behavior

19. (6 points) Sketch the graph  $y = \sin(\frac{1}{2}x) + 3$ . Find the amplitude, period, phase shift, and midline. Label two points on your graph: one maximum point, one minimum point.