

Total Possible Points: 120

Name: _____

1. The n^{th} term of a sequence is given. Write the first four terms of the sequence. Express the terms in simplified form when applicable. (4)

$$c_n = 10 \left(\frac{-1}{5} \right)^n$$

2. The n^{th} term of a sequence is given. Find the indicated term. Express the term as a fraction in lowest terms. (4)

$$a_n = 6n - 6; \text{ find } a_{167}$$

3. Write the first five terms of the sequence defined recursively. Express the terms as simplified fractions when applicable. (4)

$$d_1 = 10, d_n = -\frac{1}{d_{n-1}}$$

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4. Evaluate the expression. (3)

$$\frac{11!}{4! \cdot 7!}$$

5. Evaluate the expression. (3)

$$\frac{(2n+3)!}{(2n+4)!}$$

6. The n^{th} term of a sequence is given. Find the indicated term. Express the term as a simplified fraction. (3)

$$d_n = \frac{(n+4)!}{4^n}; \text{ find } d_3$$

7. Find the sum. Express the sum as a fraction in lowest terms. (4)

$$\sum_{n=2}^6 \left(\frac{1}{3}\right)^n$$

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8. Write the sum using summation notation. There may be multiple representations. Use i as the index of summation. (4)

$$-\frac{1}{4} + \frac{1}{16} - \frac{1}{64} + \frac{1}{256}$$

9. Determine whether the sequence is arithmetic. If so, find the common difference. (3)

2, 4, 8, 16, ...

10. Perform the following:

- (a) Write a nonrecursive formula for the n^{th} term of the arithmetic sequence based on the given information. Write numbers as integers or simplified fractions. $a_1 = \frac{1}{4}$, $d = \frac{1}{5}$ (3)

- (b) Find a_{10} . Write numbers as integers or simplified fractions. (2)

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11. Find the sum. (5)

$$3 + 8 + 13 + \dots + 58$$

12. Write the first five terms of a geometric sequence based on the given information about the sequence. Express the terms as integers or simplified fractions. (5)

$$a_1 = 59 \text{ and } a_n = \frac{1}{2}a_{n-1} \text{ for } n \geq 2$$

13. Find the sixth term of the geometric sequence from the given information. Express the term as an integer or simplified fraction. (4)

$$a_1 = 16 \text{ and } a_2 = -8$$

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14. Find a_1 and r for a geometric sequence from the given information. (5)

$$a_2 = 27 \text{ and } a_5 = 729$$

15. Find the sum of the geometric series, if possible. (4)

$$\sum_{n=1}^6 3(3)^{n-1}$$

16. For the points $(-1, 4)$ and $(4, 9)$,

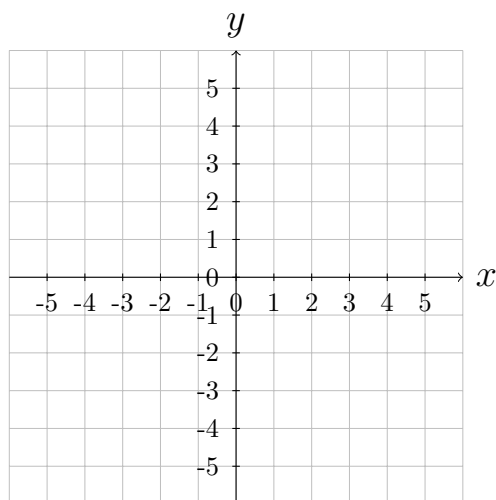
- (a) Find the exact distance between the points. (3)

- (b) Find the midpoint of the line segment whose endpoints are the given points. (2)

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17. Determine if the given points form the vertices of a right triangle. (5)

$M(3, 2)$, $P(5, 0)$, and $Q(-1, -2)$



18. Determine the center and radius of the circle. (3)

$$(x - 2)^2 + (y - 7)^2 = 9$$

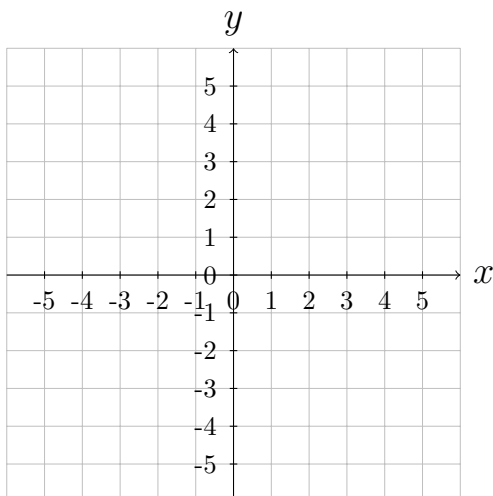
19. Given a circle with center $(-1, 6)$ and radius 1,

(a) Write an equation of the circle in standard form.

(3)

(b) Graph the circle.

(2)



20. Write the equation in the form $(x - h)^2 + (y - k)^2 = r^2$. Then, if the equation represents a circle, identify the center and radius.

(5)

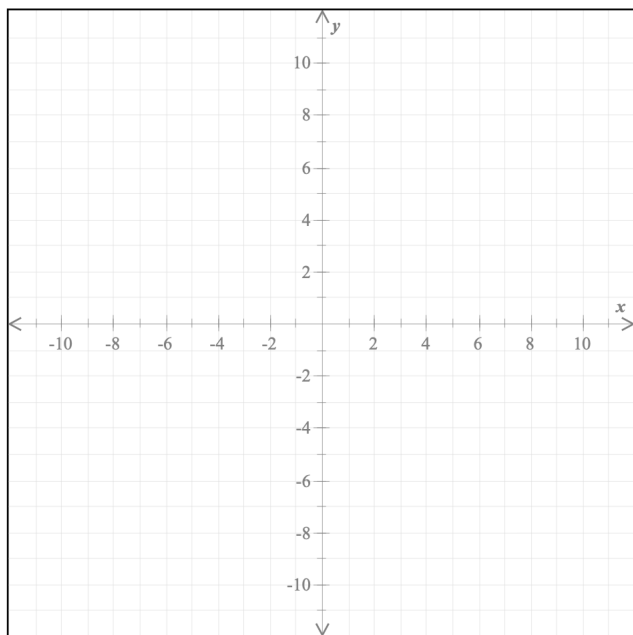
$$x^2 + y^2 + 14x - 2y + 49 = 0$$

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21. An equation of an ellipse is given. Express numbers in exact, simplest form. (10)

$$-100x^2 - 4y^2 = -100$$

- (a) Write the equation in standard form and identify the center of the ellipse.
- (b) Determine the value of a and b .
- (c) Identify the vertices.
- (d) Identify the endpoints of the minor axis.
- (e) Identify the foci.
- (f) Graph the ellipse.



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22. An equation of an ellipse is given. The center of the ellipse is: (3)

$$\frac{(x+1)^2}{36} + \frac{(y-3)^2}{49} = 1$$

- (a) (1, 3)
- (b) (-1, 3)
- (c) (6, 7)
- (d) (-6, -7)

23. Write the standard form of an equation of the ellipse (5)

$$9x^2 + 25y^2 - 36x + 35 = 0$$

by completing the square.

24. Write the standard form of the equation of the hyperbola subject to the given conditions. (5)

Vertices: (4, 2), (-6, 2); Slope of the asymptotes: $\pm \frac{7}{5}$

25. Identify the equation as representing an ellipse or a hyperbola, and match the equation with the graph. (4)

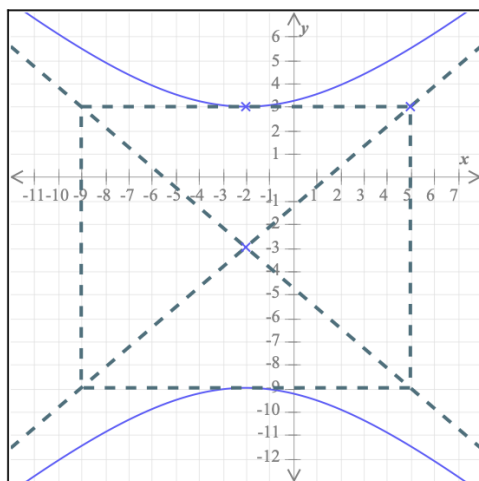
$$-\frac{(x+2)^2}{49} + \frac{(y+3)^2}{36} = 1$$

(a) Circle the correct answer:

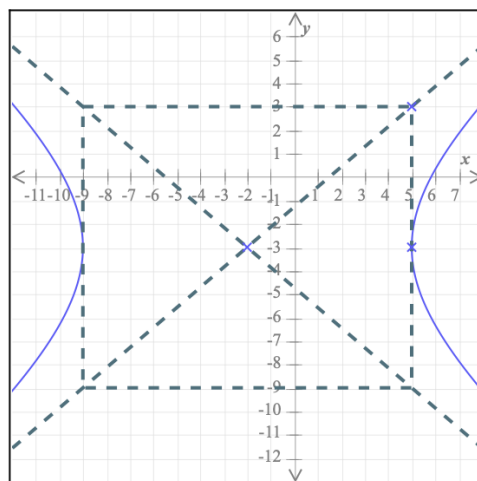
The equation is an ellipse.

The equation is a hyperbola.

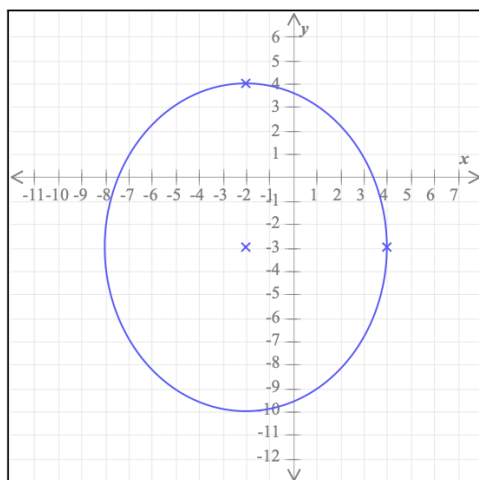
(b) Choose the correct graph.



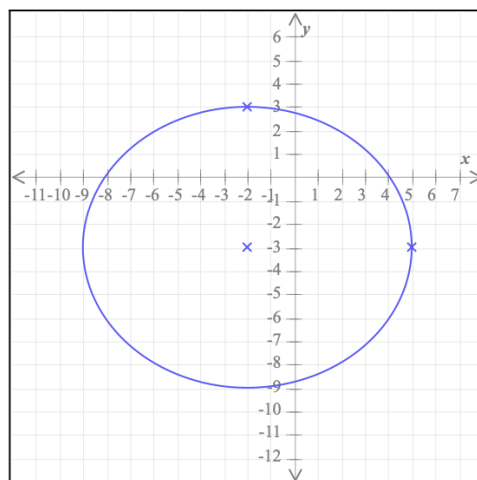
☐ A



☐ B



☐ C

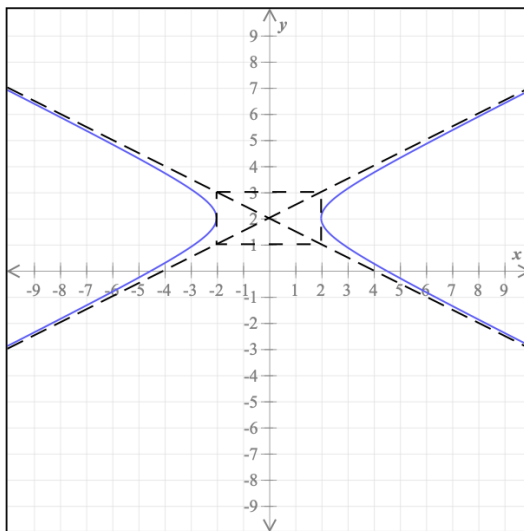


☐ D

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26. Find the standard form of the equation of the hyperbola.

(5)



27. For the given model of the form $y^2 = 4px$,

(5)

- (a) Determine the value of p .
- (b) Identify the focus of the parabola.
- (c) Write an equation for the directrix.

Given model: $-11x = y^2$