

Grade 12
Pre-Calculus Mathematics
Achievement Test

Booklet 2

January 2020

Grade 12 pre-calculus mathematics achievement test.
Booklet 2. January 2020

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Available in alternate formats upon request.

Grade 12 Pre-Calculus Mathematics Achievement Test

DESCRIPTION

Time Required to Complete the Test: 3 hours

Additional Time Allowed: 30 minutes

Numbers and Marks by Question Type

	Selected Response	Constructed Response	Marks
Booklet 1*	—	14	34
Booklet 2	8	21	56
Total	8	35	90

* The first 4 questions with the symbol  in *Booklet 1* require a scientific calculator. You will have access to your calculator for the first 45 minutes of the test.

Note that diagrams and graphs provided in the test booklets may not be drawn to scale.

DIRECTIONS

Selected Response Questions

- Calculators are **not** allowed for this part of the test.
- You may use the spaces beside each question for rough work.
- Provide only one answer per question.
- There is no penalty for guessing.
- Record your answers on the sheet provided.

Constructed Response Questions

- Calculators are **not** allowed for this part of the test.
- Write each solution in the space provided.
- For full marks, your answer must show all pertinent diagrams, calculations, and explanations.
- Your solutions should be neat, clear, and well organized.

Electronic communication between students through phones, email, or file sharing during the test is strictly prohibited. Please turn off your cell phone and all other such devices.

No marks will be awarded for work done on this page.

Question 15

1 mark

Given $f(x) = -2x - 5$ and $g(x) = x + 7$, identify the equation of $h(x) = f(g(x))$.

a) $h(x) = -2x^2 - 35$

b) $h(x) = -2x - 19$

c) $h(x) = -2x^2 - 19x - 35$

d) $h(x) = -2x + 2$

Question 16

1 mark

The function $y = f(x)$ has a domain of $[2, 5]$ and a range of $[-6, 3]$. Identify the range of the function $y = f^{-1}(x)$.

a) $[-6, 3]$

b) $[-5, 2]$

c) $[-3, 6]$

d) $[2, 5]$

Question 17

1 mark

Identify the function that has a graph with a point of discontinuity (hole) at $x = -3$.

a) $y = \frac{x+3}{x^2-9}$

b) $y = \frac{x-3}{x^2-9}$

c) $y = \frac{x^2-9}{x-3}$

d) $y = \frac{x^2+9}{x+3}$

Question 18

1 mark

Identify the value of $\ln e$.

- a) 0
- b) $\log e$
- c) 1
- d) e

Question 19

1 mark

When the polynomial function, $p(x)$, is divided by $(x-4)$ the remainder is 17. Identify which statement is true.

- a) $p(4) = 17$
- b) $p(-4) = 17$
- c) $p(4) = 0$
- d) $p(-4) = 0$

Question 20

1 mark

Identify the expression equivalent to $\frac{(n-6)!}{(n-4)!}$.

- a) $(n-4)(n-5)$
- b) $\frac{1}{(n-4)(n-5)}$
- c) $(n-6)(n-5)$
- d) $\frac{1}{(n-6)(n-5)}$

Question 21

1 mark

Identify the quadrant in which θ terminates if $\sec \theta = -\frac{4}{3}$ and $\sin \theta > 0$.

- a) I
- b) II
- c) III
- d) IV

Question 22

1 mark

Identify the expression that represents all angles that are coterminal with $\frac{\pi}{3}$.

- a) $\frac{\pi}{3} + \pi k, k \in \mathbb{Z}$
- b) $\frac{\pi}{3} + \pi k, k \in \mathbb{R}$
- c) $\frac{\pi}{3} + 2\pi k, k \in \mathbb{Z}$
- d) $\frac{\pi}{3} + 2\pi k, k \in \mathbb{R}$

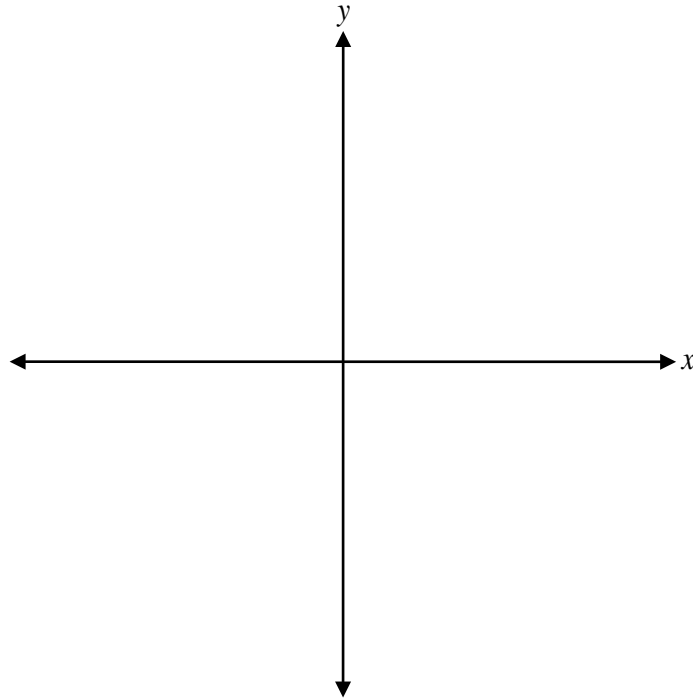
Given $f(x) = \frac{1}{2}x - 3$, state the coordinates of an invariant (unchanged) point when sketching the graph of $y = \sqrt{f(x)}$.

Solve, algebraically.

$$125^{3x+4} = \left(\frac{1}{5}\right)^x$$

Given $\sin \theta = -\frac{\sqrt{2}}{2}$ and $\cos \theta = -\frac{\sqrt{2}}{2}$, justify that the value of $\tan(2\theta)$ is undefined.

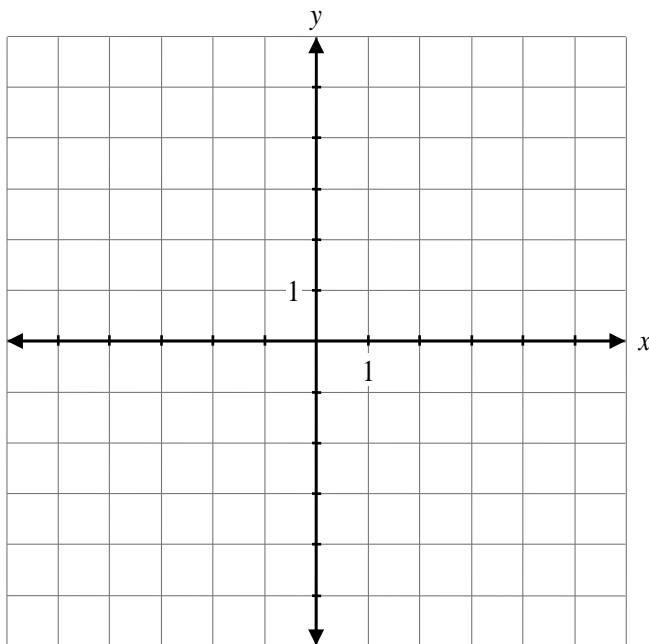
Sketch the graph of $y = -2\log_3 x$.



Evaluate.

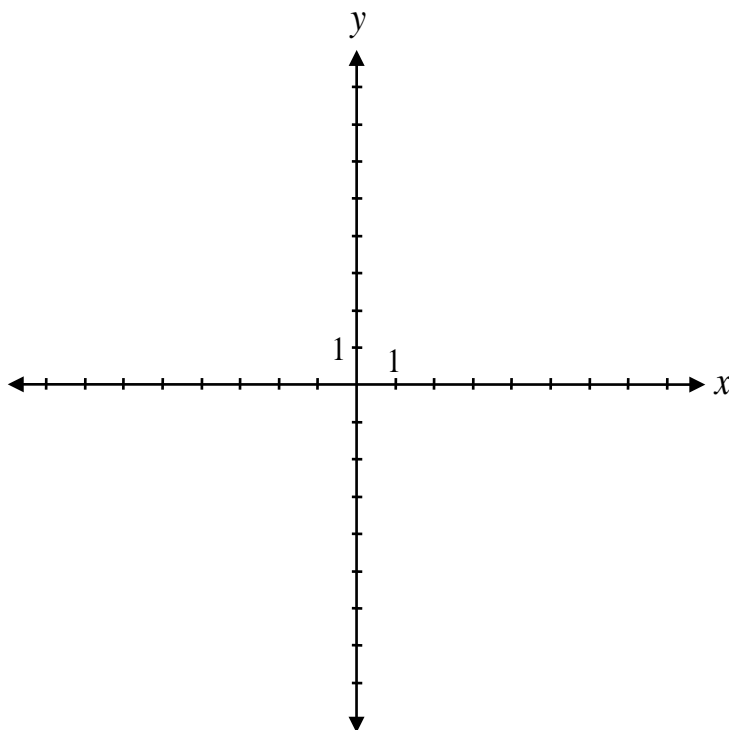
$$\cos\left(\pi \cdot \sin\left(-\frac{\pi}{6}\right)\right)$$

a) Given $f(x) = -x + 2$, sketch the graph of $h(x) = f(f(x))$.



b) Explain why the domain of $h(x) = f(f(x))$ does not have any restrictions.

a) Sketch the graph of $f(x) = \frac{3x-5}{2x+4}$.



b) State the range of $f(x)$.

Range: _____

Determine, algebraically, the equation of $p(x)$ that satisfies all of the following conditions:

- $p(x)$ is a polynomial function of degree 4
- $p(x)$ has a zero at 3 with a multiplicity of 2
- $p(x)$ has zeroes at -1 and -2
- $p(x)$ passes through the point $(2, 24)$.

$p(x) =$ _____

Verify, by substitution, that the equation $\frac{\cos \theta + \cot \theta}{\cot \theta} = 1 + \sin \theta$ is true for $\theta = \frac{2\pi}{3}$.

Left-Hand Side	Right-Hand Side

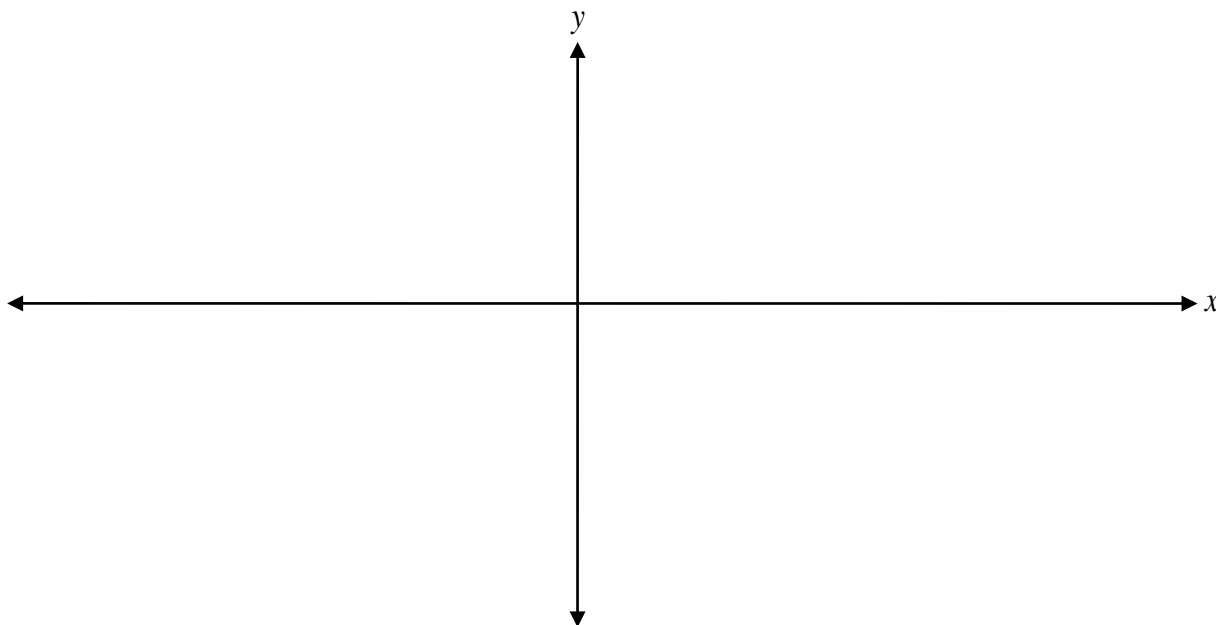
Jyugo was asked to state the equation of the vertical asymptote(s) on the graph of $f(x) = \frac{3x-15}{x^2-5x}$.

His solution:

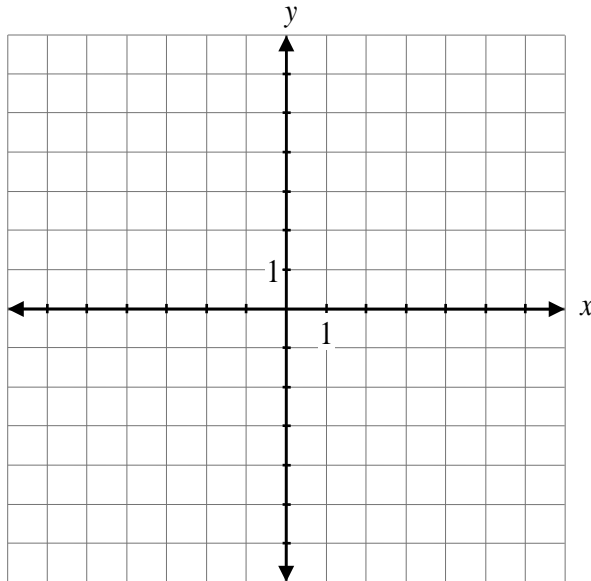
$$f(x) = \frac{3(x-5)}{x(x-5)}$$
$$x=0 \quad x=5$$

Explain why his solution is incorrect.

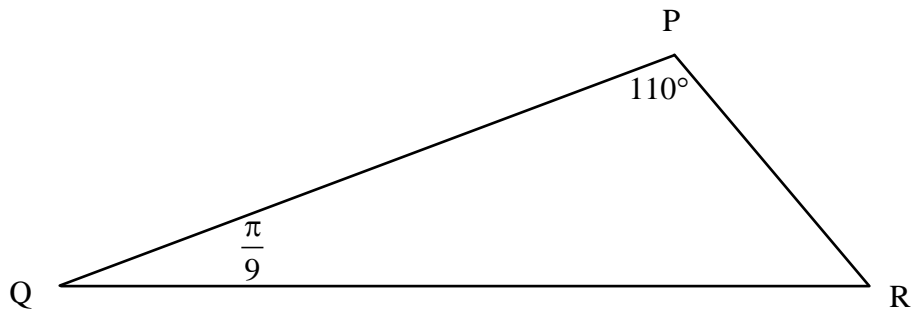
Sketch the graph of $y = \sin\left(\frac{1}{2}x\right) - 1$ over the interval $[-2\pi, 2\pi]$.



Sketch the graph of $y = \sqrt{-2x + 6}$.



Determine the measure of angle R, in radians.



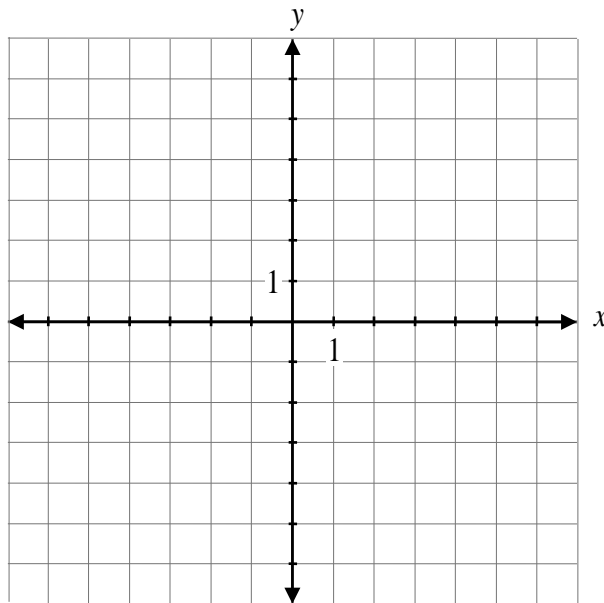
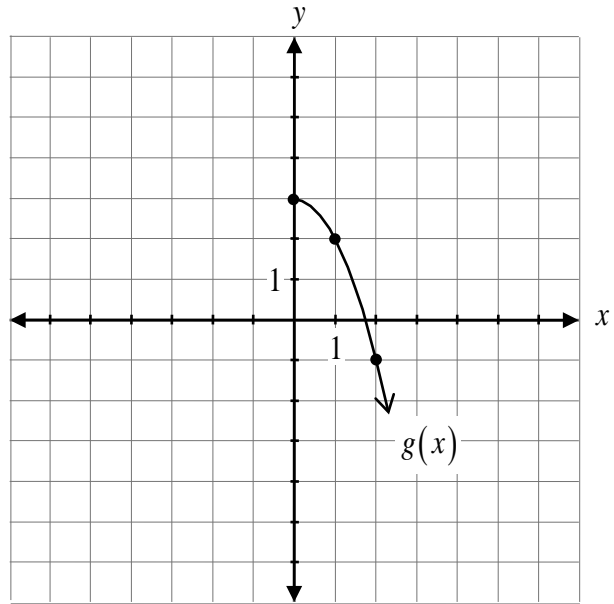
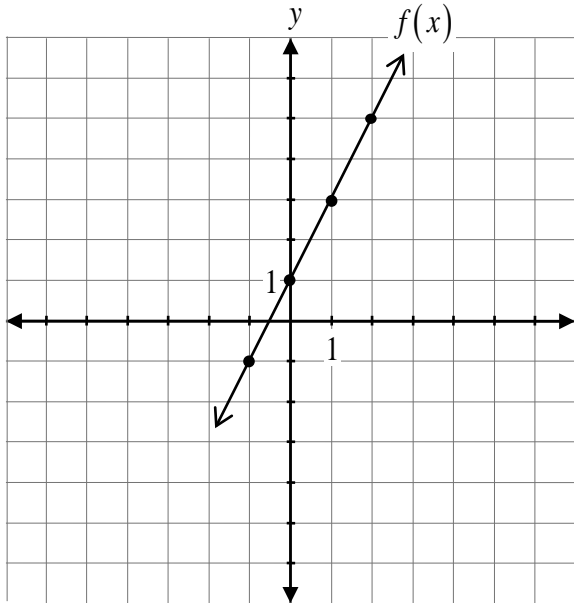
Given $f(x) = \sqrt{x-4}$, state the equation of the resulting function, $g(x)$, after a reflection over the x -axis.

$g(x) =$ _____

a) Determine the coterminal angle of $\frac{29\pi}{12}$ over the interval $[0, 2\pi]$.

b) Determine the exact value of $\sin\left(\frac{29\pi}{12}\right)$.

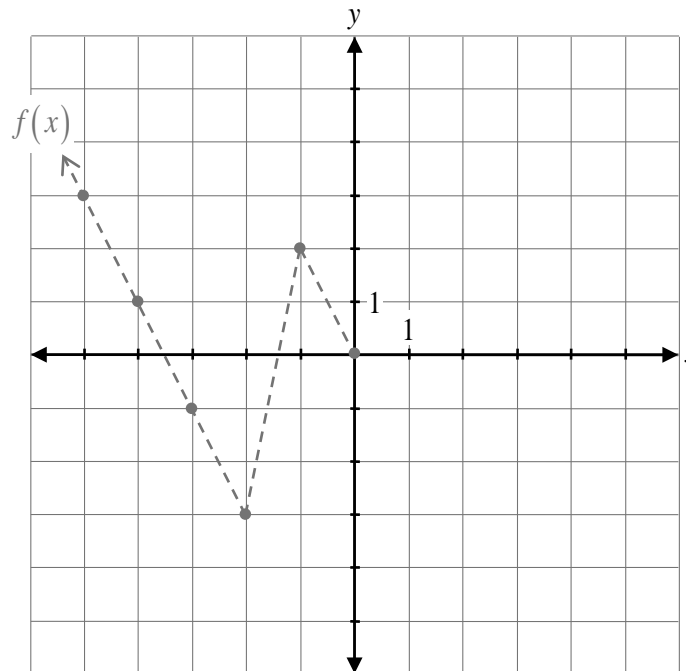
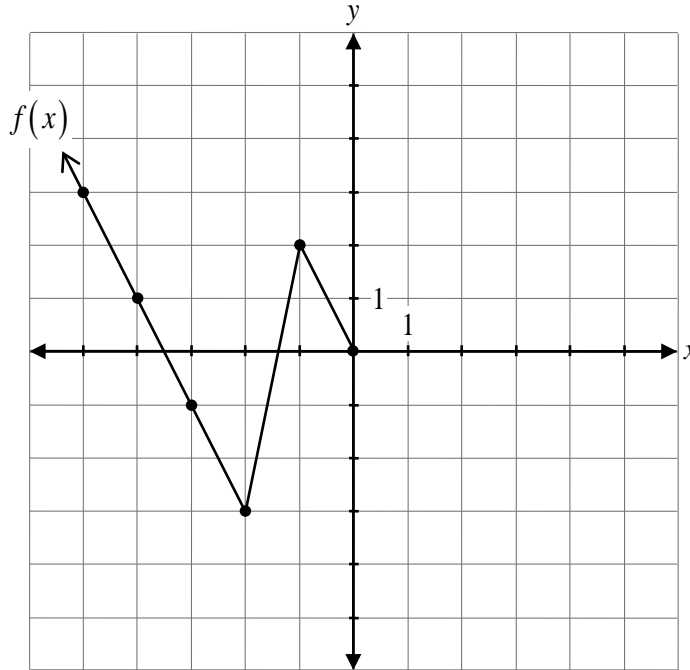
Given the graphs of $f(x)$ and $g(x)$, sketch the graph of $h(x) = f(x) - g(x)$.



Determine an equation of a sinusoidal function that has the following characteristics:

- an amplitude of 3
- a period of 6
- a minimum value of -5

Given the graph of $y = f(x)$, sketch the graph after a reflection over the line $y = x$.



The graph of $f(x)$ has already been drawn for your reference. No marks will be awarded for the graph of $f(x)$.

a) Determine the remainder when $3x^3 + 5x^2 - 13x - 3$ is divided by $(x+3)$.

b) Is $(x+3)$ a factor of $3x^3 + 5x^2 - 13x - 3$? Explain your reasoning.

State the range, the y -intercept, and the equation of the asymptote of the exponential function,

$$f(x) = 3^{x-1} + 2.$$

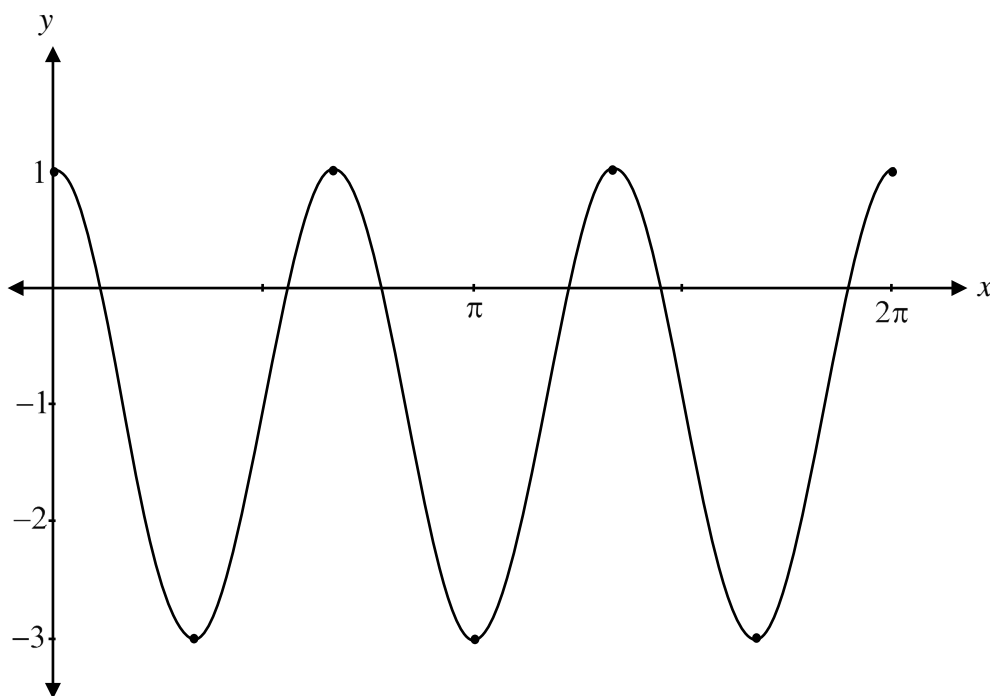
Range: _____

y -intercept: _____

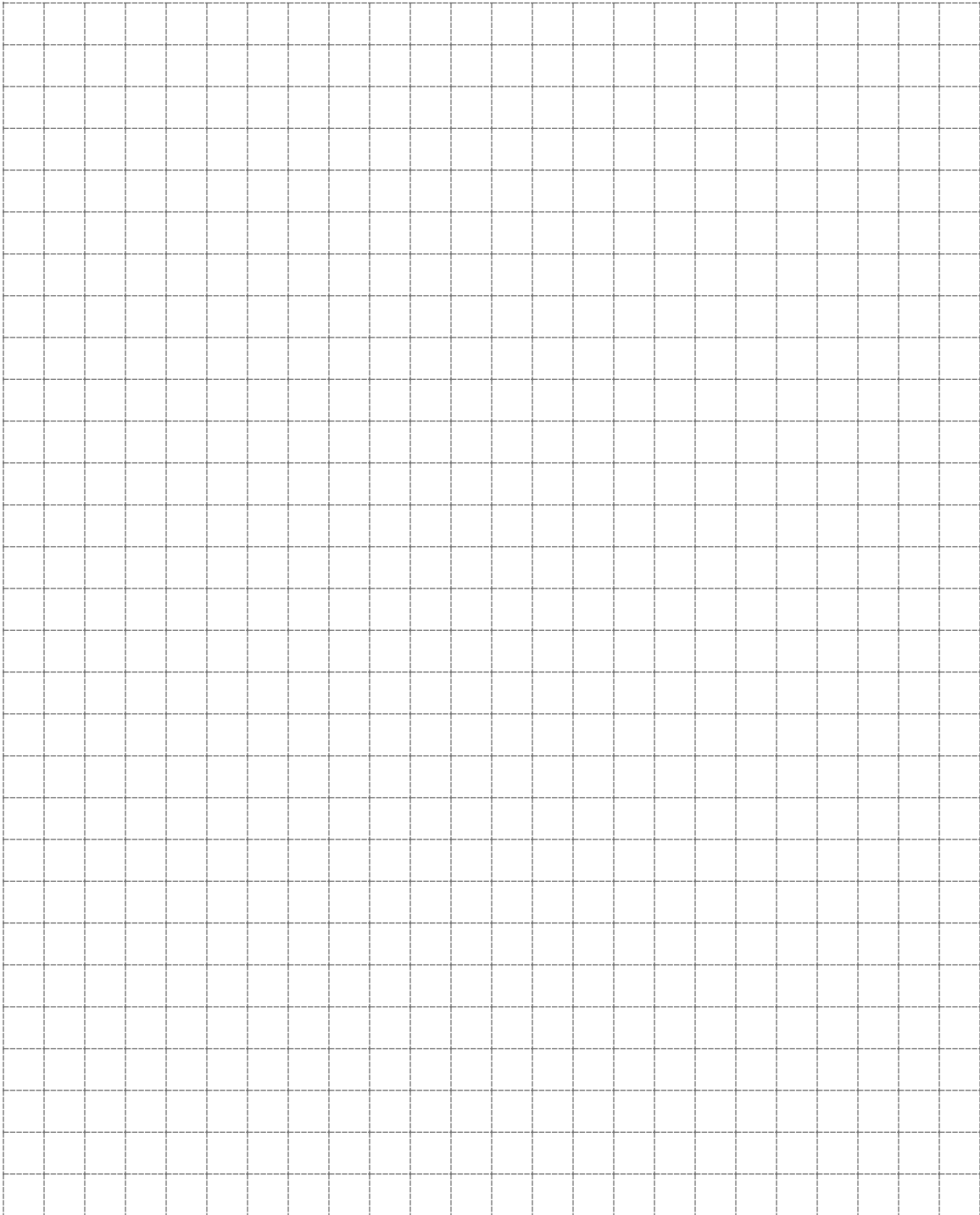
Equation of the asymptote: _____

The graph of $y = 2 \cos(3x) - 1$ below can be used to solve the equation $0 = 2 \cos(3x) - 1$ over the interval $[0, 2\pi]$. Indicate on the graph where to find at least one solution to the equation

$$0 = 2 \cos(3x) - 1.$$



No marks will be awarded for work done on this page.



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