

MA13001

The functions f and g are defined by $f(x)=x-1$ and $g(x)=(x+3)^2$.

$g(f(x))$ is equal to

(A) $(x-1)(x+3)^2$

(B) $(x+3)^2-1$

(C) $(2x-2)^2$

(D) $(x+2)^2$

(E) x^2+8

A function f is defined by:

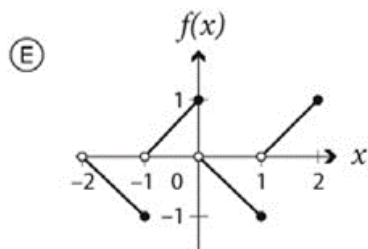
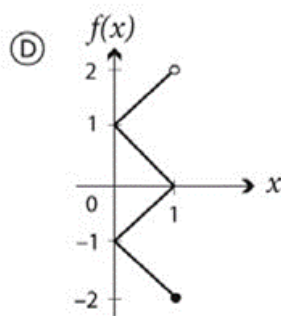
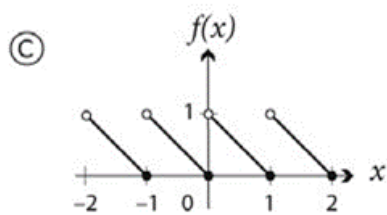
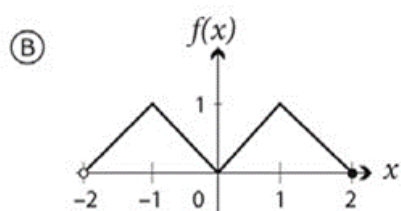
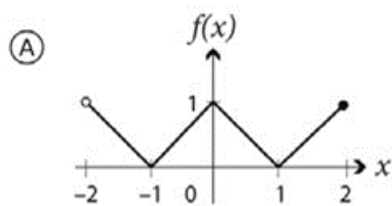
$$f(x) = -x - 1 \quad \text{if} \quad -2 < x \leq -1$$

$$f(x) = x + 1 \quad \text{if} \quad -1 < x \leq 0$$

$$f(x) = -x + 1 \quad \text{if} \quad 0 < x \leq 1$$

$$f(x) = x - 1 \quad \text{if} \quad 1 < x \leq 2$$

Which is the graph of f ?



MA13003

Two mathematical models are proposed to predict the return y , in dollars, from the sale of x thousand units of an article (where $0 < x < 5$). Each of these models, P and Q, is based on different marketing methods.

$$\begin{array}{ll}\text{model P:} & y = 6x - x^2 \\ \text{model Q:} & y = 2x\end{array}$$

For what values of x does model Q predict a greater return than model P?

- Ⓐ $0 < x < 4$
- Ⓑ $0 < x < 5$
- Ⓒ $3 < x < 5$
- Ⓓ $3 < x < 4$
- Ⓔ $4 < x < 5$

MA13004

$\lim_{x \rightarrow +\infty} \frac{(2x+1)(x+1)}{3x^2-2}$ is equal to

Ⓐ $-\frac{1}{2}$

Ⓑ $\frac{2}{3}$

Ⓒ 1

Ⓓ 6

Ⓔ ∞

MA13006

The derivative with respect to x of $\frac{4}{\sqrt{3x-4}}$ is

(A) $12\sqrt{3x-4}$

(B) $\frac{4}{\sqrt{3}}$

(C) $\frac{-2}{(3x-4)^{\frac{3}{2}}}$

(D) $\frac{-6}{(3x-4)^{\frac{3}{2}}}$

(E) $6\sqrt{3x-4}$

MA13007

One side of an equilateral triangle lies along the x -axis. The sum of the slopes of the three sides is

- Ⓐ 0
- Ⓑ -1
- Ⓒ 1
- Ⓓ $2\sqrt{3}$
- Ⓔ $1+2\sqrt{3}$

MA13008

Triangle PQR is an isosceles right triangle with a right angle at P . If PT is a median of the triangle, then PT has the same length as

- Ⓐ PR
- Ⓑ PQ
- Ⓒ QR
- Ⓓ QT

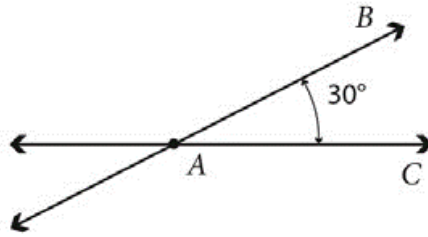
MA13009

How many points with integer coordinates are there on the graph of the function $y = \frac{12}{x}, x > 0$?

- Ⓐ 2
- Ⓑ 4
- Ⓒ 6
- Ⓓ infinitely many

MA13021

As line AB rotates about line AC in space, keeping an angle of 30° , what figure is traced out by the line AB ?



- Ⓐ a cone
- Ⓑ a cylinder
- Ⓒ a spiral
- Ⓓ a circle
- Ⓔ a sphere

MA13024

$\int_1^2 \left(x - \frac{1}{x^2} \right) dx$ is equal to

Ⓐ $-3\frac{1}{8}$

Ⓑ 1

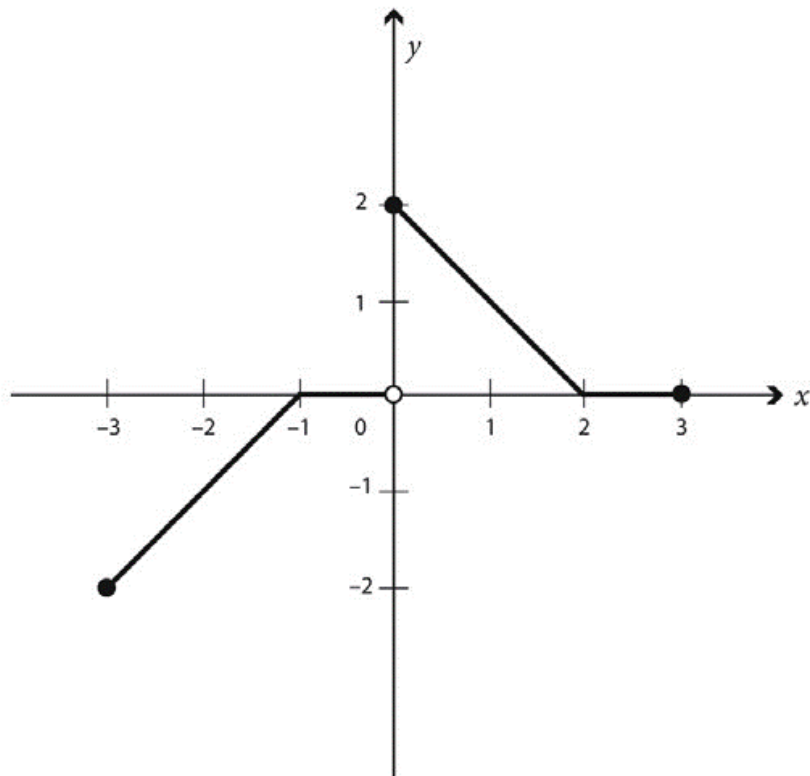
Ⓒ $2\frac{5}{8}$

Ⓓ 4

Ⓔ $4\frac{1}{2}$

MA13025A

The function $y = f(x)$, $-3 \leq x \leq 3$, is defined in the following graph

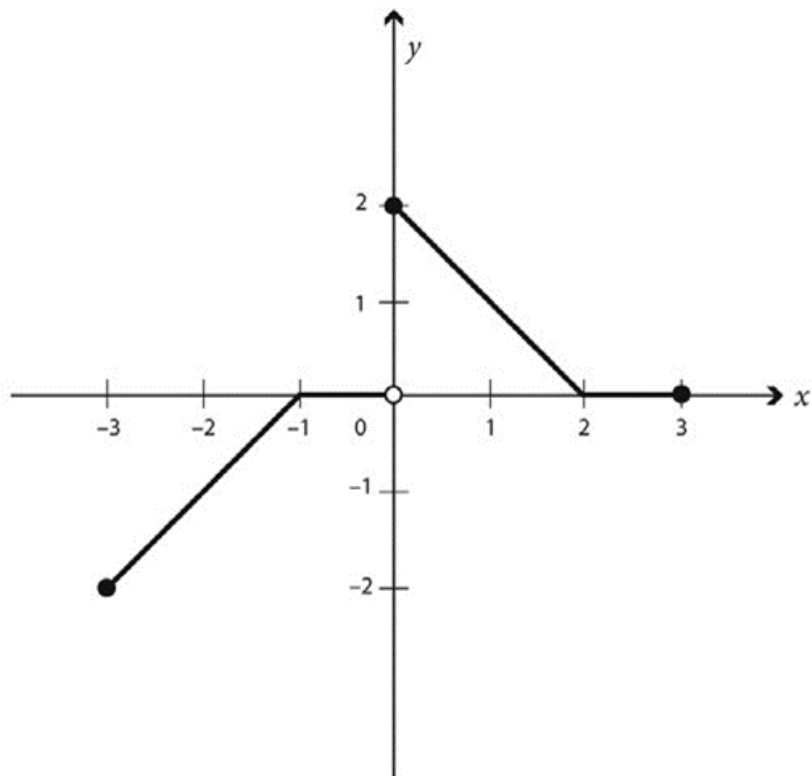


A. For what value(s) of x in the interval $-3 < x < 3$ is the function f NOT continuous?

B. For what value(s) of x in the interval $-3 < x < 3$ is the function f NOT differentiable?

MA13025B

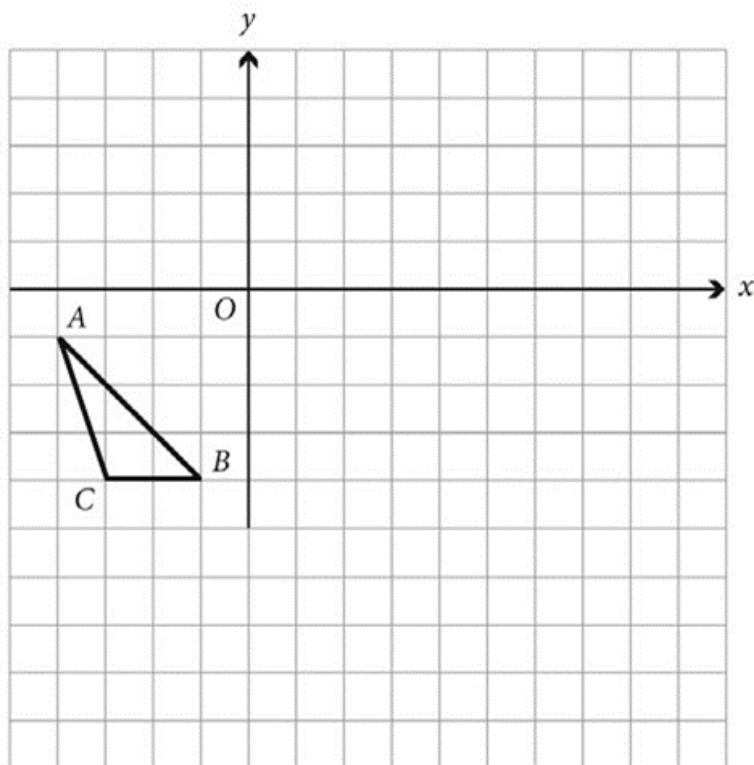
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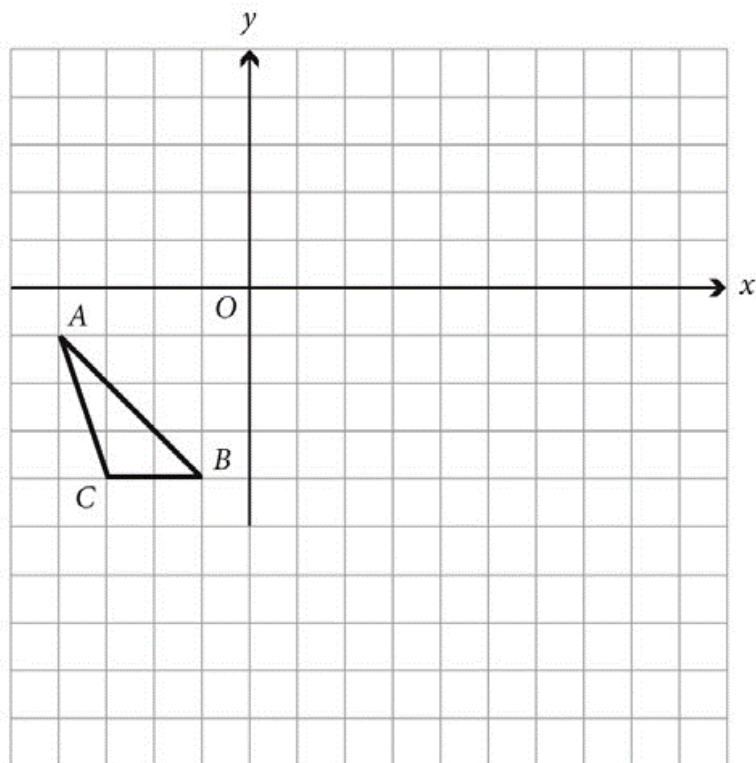
MA13026A

- A. Triangle ABC is reflected in the y -axis. On the diagram, draw and label triangle $A'B'C'$, the image of triangle ABC under this reflection.
- B. Triangle ABC is rotated through 90° anti-clockwise, centre O . On the diagram, draw and label triangle $A''B''C''$, the image of triangle ABC under this rotation.



MA13026B

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MA13027

A regular polygon of n sides is inscribed in a circle of radius 1.

What is the value of the limit of the perimeter of the polygon as the number of sides n increases to infinity?

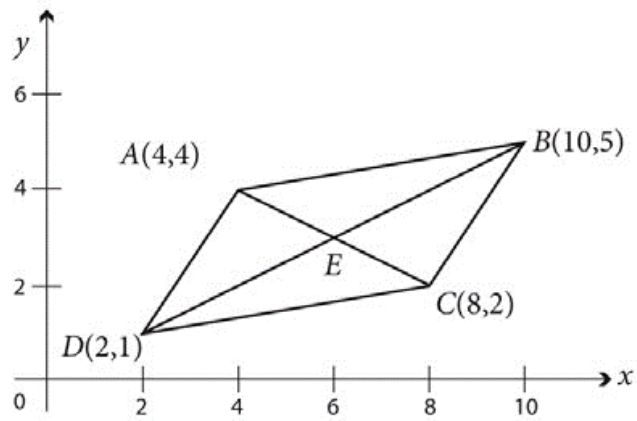
MA13028

For every natural number n , $1^2 + 3^2 + \dots + (2n-1)^2 = \frac{n(4n^2-1)}{3}$

To prove this by MATHEMATICAL INDUCTION, what are the essential steps that will need to be carried out? (Do not do the actual proof.)

MA13029

In the quadrilateral $ABCD$ below, diagonals AC and BD intersect at point E .
PROVE that E is the midpoint of AC and BD . Show all your work.



An infinite geometric series has the first term 3 and the third term $\frac{1}{3}$. All the terms of the series are positive. What is the sum of the series?

(A) $\frac{27}{8}$

(B) $\frac{10}{3}$

(C) $\frac{9}{4}$

(D) $\frac{9}{2}$

MA23135

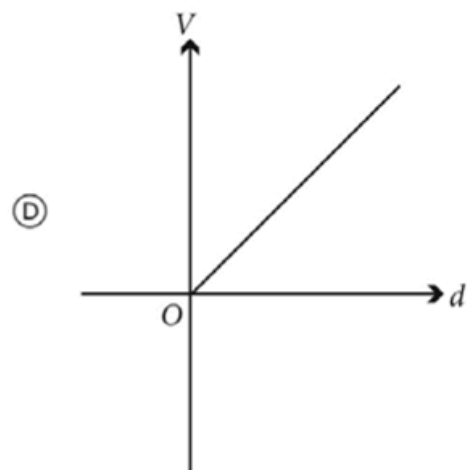
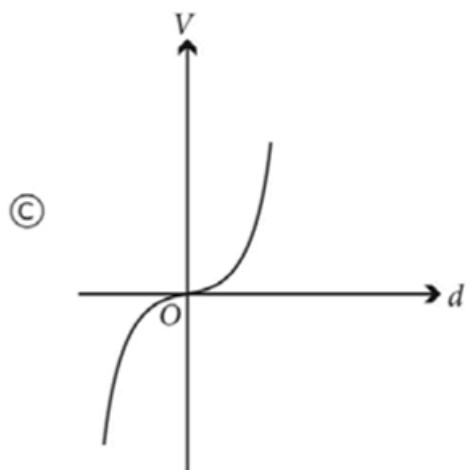
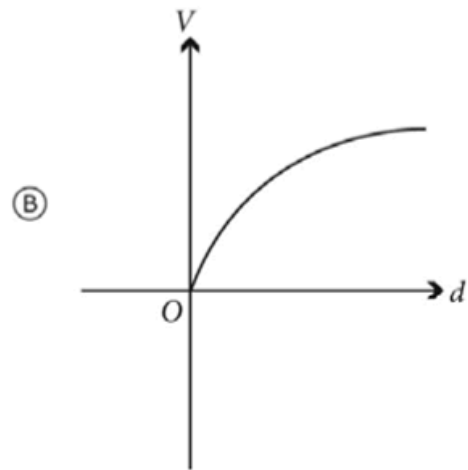
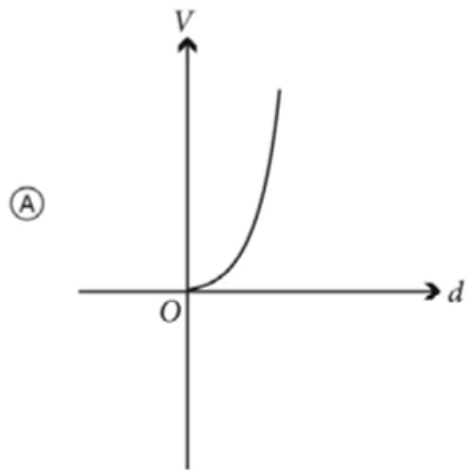
$$\frac{x+1}{x-2} > 1$$

For which values of x is the inequality shown above satisfied?

Answer: _____

MA23208

A spherical balloon is blown up. Which graph shows the volume V as a function of the diameter d ?



MA23165

Determine $\lim_{x \rightarrow 1} \frac{x^2 + x - 2}{x^2 - 1}$.

Show your work.

MA23039

$$f(x) = e^{\cos x}$$

What is $f'(x)$?

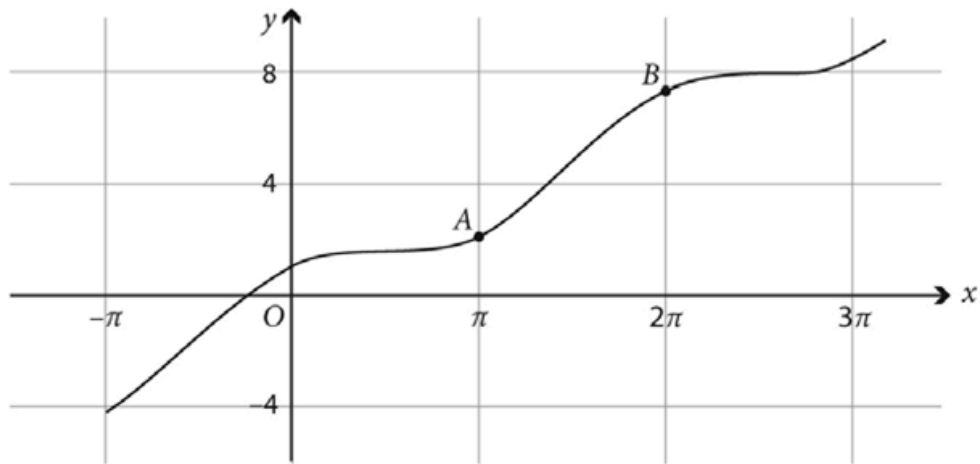
- Ⓐ $e^{\cos x}$
- Ⓑ $e^{-\sin x}$
- Ⓒ $e^{\cos x} \cdot \sin x$
- Ⓓ $-e^{\cos x} \cdot \sin x$

MA23159

Find $f'(x)$, when $f(x) = \frac{3x+2}{x-1}$.

Show your work.

MA23198



Sophia is studying the graph of the function $y = x + \cos x$ shown above. She says that the slope at point A is the same as the slope at point B . Explain why she is correct.

MA23042

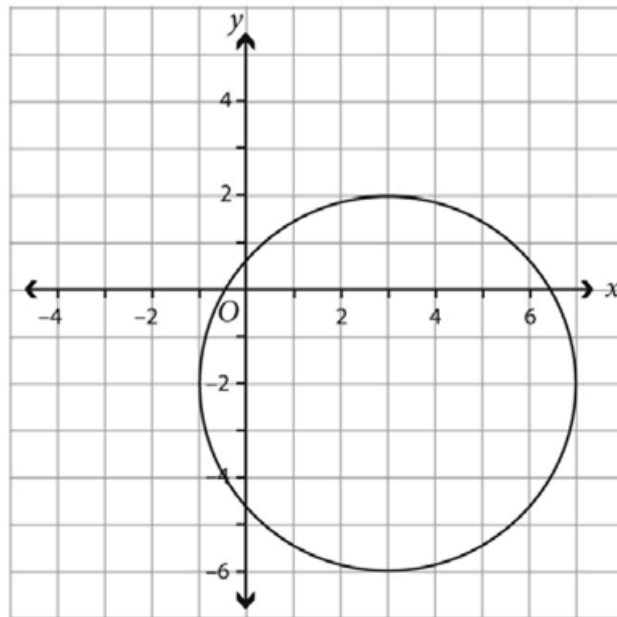
What is $\int \frac{x^2+2}{x} dx$? ($x > 0$)

Ⓐ $\frac{1}{2}x^2 - \frac{2}{x^2} + C$

Ⓑ $\frac{1}{2}x^2 + 2 \ln x + C$

Ⓒ $\frac{1}{2}x^2 + \ln 2x + C$

Ⓓ $\frac{4}{3}x^3 + 4x^3 + C$



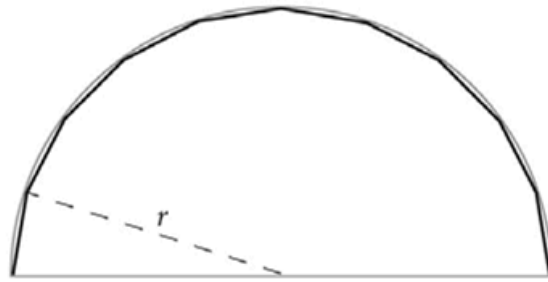
What is the equation of the circle shown above?

- Ⓐ $x^2 + y^2 - 6x + 4y - 9 = 0$
- Ⓑ $x^2 + y^2 + 6x - 4y + 9 = 0$
- Ⓒ $x^2 + y^2 + 6x - 4y - 3 = 0$
- Ⓓ $x^2 + y^2 - 6x + 4y - 3 = 0$

MA23080

How many solutions does the equation $\sin x + \cos x = 2$ have in the interval 0 to 8π ?

- Ⓐ 0
- Ⓑ 2
- Ⓒ 4
- Ⓓ 8



The figure shows a semicircular room seen from above. An architect is placing 10 flat windows in the room as shown. If the radius of the circle is r , which of the following equations would allow the architect to determine the width of each window?

- (A) $w = r \sin 9^\circ$
- (B) $w = 2r \sin 9^\circ$
- (C) $w = r \cos 18^\circ$
- (D) $w = 2r \sin 18^\circ$

MA23004

A sheet of paper 0.01 cm thick is cut in two, and one piece is placed on top of the other. The two sheets of paper are then cut in two and made into a pile of 4 sheets. If this process could be repeated 8 more times, how thick would the pile of papers be?

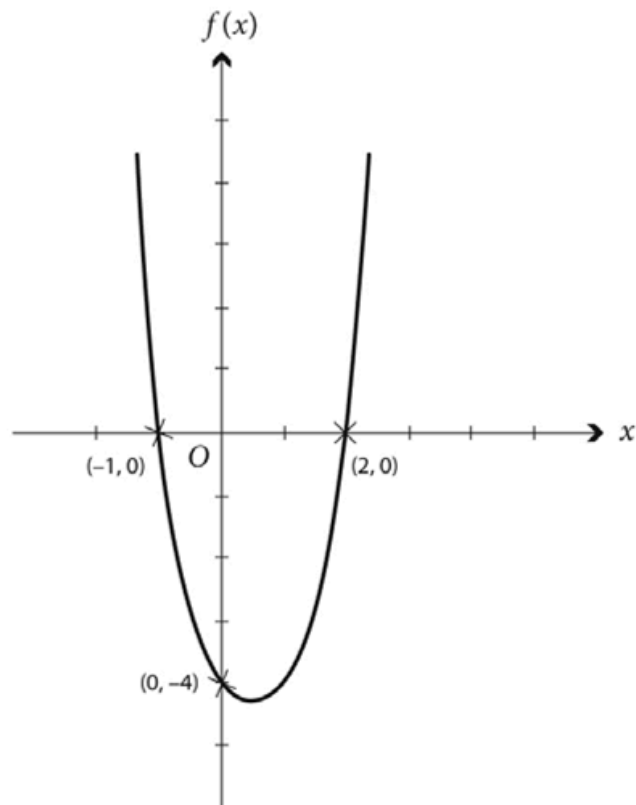
- Ⓐ 0.2 cm
- Ⓑ 10.24 cm
- Ⓒ 20.48 cm
- Ⓓ 32.0 cm

MA23063

If $x = -1 + \frac{1}{2}i$, which of the following is equal to $\frac{5}{x}$?

- Ⓐ $-5 + i$
- Ⓑ $-4 - 2i$
- Ⓒ $-4 + 2i$
- Ⓓ $4 + 2i$

MA23141



The graph of the function f is shown above. The equation of the function f is given by $f(x) = ax^2 + bx + c$. Find the values of a , b , and c .

Show your work.

MA23133

The function f is given by $f(x) = x^2 + 4$. Another function g is given by $g(u) = \sqrt{2u - 1}$. Determine the minimum value of $g(f(x))$.

Ⓐ 0

Ⓑ $\sqrt{3}$

Ⓒ $\sqrt{\frac{7}{2}}$

Ⓓ $\sqrt{7}$

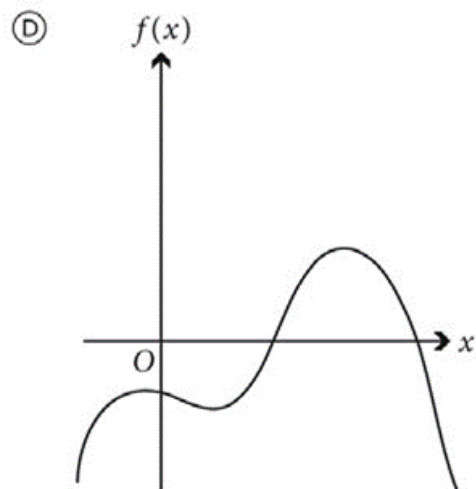
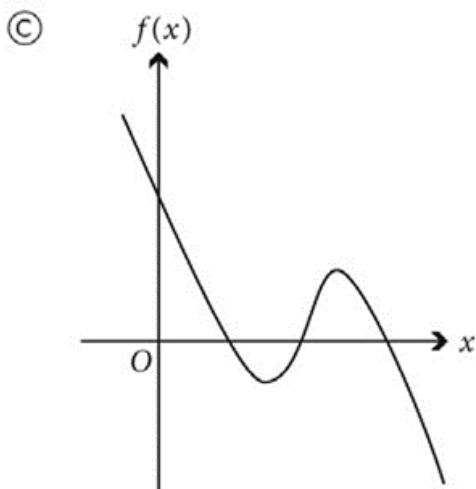
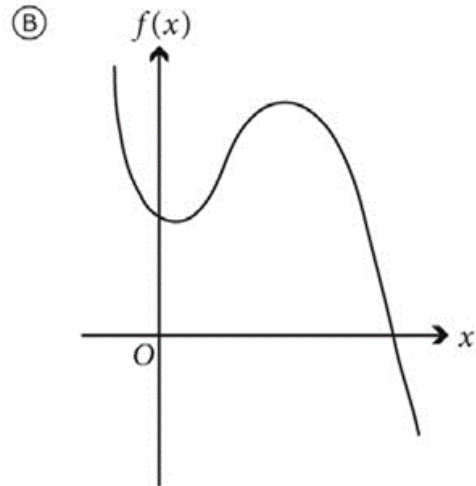
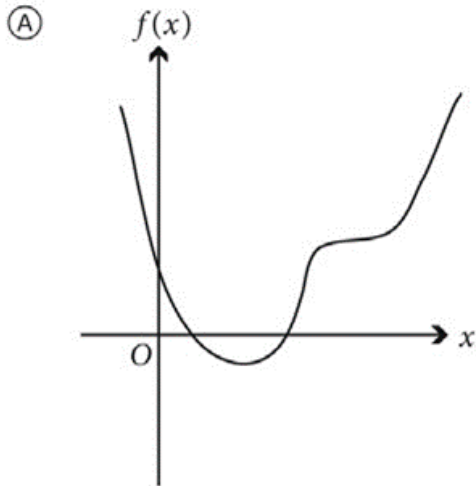
MA23158

A car starts braking as it approaches a road junction. After braking for t seconds, the car has traveled a distance of $s(t)$ meters, where $s(t) = -t^2 + 20t$. How far does the car travel from the time the brakes are applied until it stops?

- Ⓐ -20 m
- Ⓑ 10 m
- Ⓒ 50 m
- Ⓓ 100 m

Which one of the graphs below has all of the following properties?

$$f(-1) > 0, f(3) < 0, f'(5) = 0, f''(5) < 0$$



MA23035A

$$f(x) = x^4 - 2x^2$$

- A. What are the values of x at the points of intersection of the graph of $f(x)$ with the x -axis?

$x =$ _____

- B. What are the maximum and minimum points of the graph of $f(x)$?

Maximum point(s): _____

Minimum point(s): _____

MA23035B

$$f(x) = x^4 - 2x^2$$

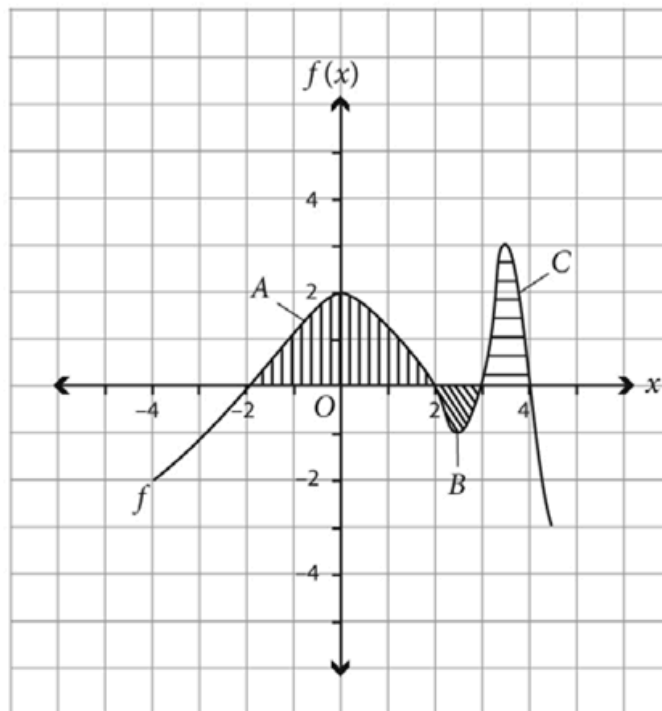
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Maximum point(s): _____

Minimum point(s): _____



For the areas between the graph of $f(x)$ and the x -axis shown above, area $A = 4.8$ units, area $B = 0.8$ units, and area $C = 2$ units.

What is the value of the definite integral $\int_{-2}^4 f(x)dx$?

- (A) 5.6
- (B) 6.0
- (C) 6.8
- (D) 7.6

MA23041

What is $\int e^{1+4x} dx$?

Ⓐ $\frac{1}{4}e^{1+4x} + C$

Ⓑ $e^{1+4x} + C$

Ⓒ $4e^{1+4x} + C$

Ⓓ $e^{x+2x^2} + C$

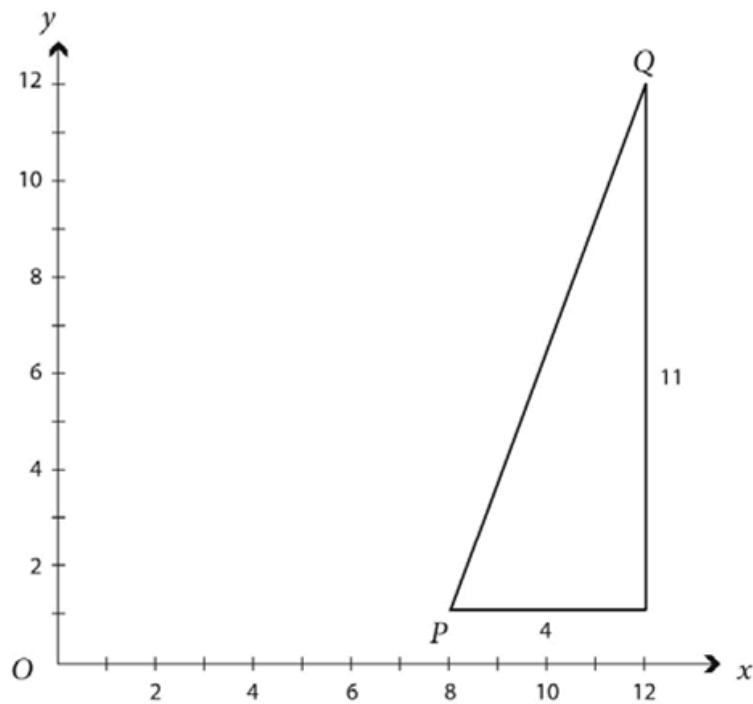
MA23182

$$\sin 2x = \frac{1}{2}$$

What are the possible values for x between 0° and 360° ?

- Ⓐ $30^\circ, 150^\circ$
- Ⓑ $195^\circ, 345^\circ$
- Ⓒ $30^\circ, 150^\circ, 210^\circ, 330^\circ$
- Ⓓ $15^\circ, 75^\circ, 195^\circ, 255^\circ$

MA23170



A straight line l passes through the points $A (1, -2)$ and $B (3, 4)$.
Is the line l parallel with PQ ?

Give a reason to support your answer.