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QUESTION 1



Drag and drop the correct answer into the space(s) provided.

The volume of a hot air balloon can be modeled by the volume of a cylinder

$$V = l\pi r^2$$

, where

l

is the height and

r

is the average radius. The hot air balloon with

$$l = 20\text{ m}$$

and

$$r = 8\text{ m}$$

is being inflated at a rate of

$$0.3\text{ m/s}$$

. Determine how an incremental increase in the volume of the balloon increases the radius, at the point when the radius is

$$r = 4\text{ m}$$

.

$V = f(r) = l\pi r^2$	Use the equation for a volume of a cylinder.
$f(4) =$ $(20)\pi(4)^2$ ✓	Substitute $r = 4\text{ m}$ and $l = 20\text{ m}$.
$f(4) = 320\pi\text{ m}^3$	Simplify. This is the volume of the balloon at

$$r = 4 \text{ m}$$

Look at the inverse function g and the derivative of the inverse with respect to V . Note that

$$f(4) = 320 \pi$$

, so

$$g(320 \pi) = 4$$

$g'(V) = \frac{1}{f'(g(V))} \quad \text{where } f'(r) = \frac{d}{dr}(f(r))$	Derivative of inverse function.
$g'(320 \pi) = \frac{1}{f'(g(320 \pi))}$	Substitute for V .
$g'(320 \pi) =$ $\frac{1}{f'(4)}$ ✓	Substitute for $g(V)$.
$f'(r) = \frac{d}{dr}(f(r)) = \frac{d}{dr}(l\pi r^2) =$ $2l\pi r$ ✓ $f'(4) = 2l\pi r = 2(20)\pi(4) = 160 \pi \text{ m}^2$	Derivative of f .
$g'(320 \pi) =$ $\frac{1}{160 \pi} \text{ m}^{-2}$ ✓	Simplify.

This is the amount the radius will change with an incremental change in volume at that instant.

↕

$\frac{1}{f'(320\pi)}$

↕

$40\pi(4)^2$

↕

πlr

↕

$48\pi\text{ m}^{-2}$

QUESTION 2



Drag and drop the correct answer into the space(s) provided.

Given the function

$f(x) = 2x^3 - 4x^2 + 5$

,

$x > 0$

, find the derivative of the inverse function of

f

at

$x = 5$

.

$f'(x) =$ $6x^2 - 8x$ ✓
--

	.
$f(2) = 5$ or $f(0) = 5$	Find $f(x) = 5$.
$f(2) = 5$	since $x > 0$
$g(5) = 2$	Find $g(5) = x$ using the definition of inverse functions.
$g'(5) =$ $\frac{1}{f'(g(5))}$ ✓	Substitute for $g(x)$.
$g'(5) =$ $\frac{1}{f'(2)}$ ✓	Substitute for $g(5)$.
$g'(5) =$ $\frac{1}{6(2)^2 - 8(2)}$ ✓	Substitute into $f'(x)$.
$g'(5) =$ $\frac{1}{8}$ ✓	Simplify.

$$\frac{1}{f'(g(2))}$$

$$6x^2 + 8x$$

$$\frac{1}{40}$$

$$\frac{1}{6(5)^2 - 8(5)}$$

$$\frac{1}{f'(5)}$$

QUESTION 3



Drag and drop the correct answer into the space(s) provided.

State the domain of the inverse function, for the function

$$f(x) = x^2 - 3$$

on the restricted domain

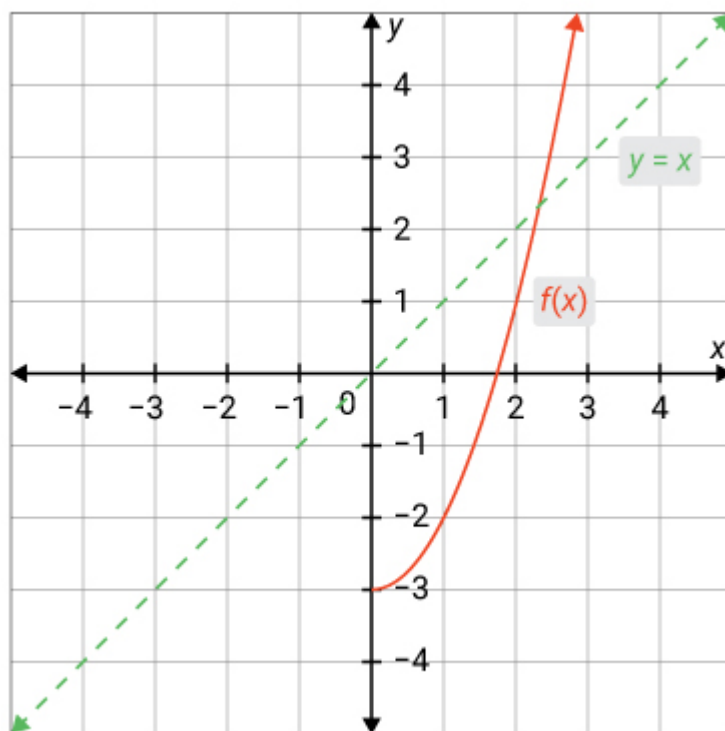
$$x \geq 0$$

. Find the derivative of the inverse function for that domain.

Use the graph of

$$f(x)$$

below.



$$g(x)$$

is one-to-one over the domain of

$$x \geq -3$$



$$g'(x) =$$

$$\frac{1}{2(x+3)^{1/2}}$$
 ✓

, over the domain of

$$x > -3$$
 ✓

$$x \geq 0$$

$$\frac{1}{3(x+2)^{1/2}}$$

$$x \leq -3$$

$$\frac{1}{2(x-3)^{1/2}}$$

$$x \leq 0$$

$$x \leq 0$$

$$x \geq 0$$

$$x \leq -3$$

$$\frac{1}{2(x+3)^{1/3}}$$

QUESTION 4



Choose the correct answer from the drop-down menu.

Find the derivative of the inverse of

$$f(x) = \sqrt[5]{3x-4}$$

$$g'(x) =$$

$$\frac{5x^4}{3}$$
 ✓ ▼

QUESTION 5



Choose the correct answer from the drop-down menu.

Find the derivative of the inverse of

$$f(x) = x^5$$

.

$$g'(x) =$$

$$\frac{1}{5x^{4/5}}$$
✓
▼

,

$$x \neq 0$$

.

QUESTION 6



Choose the correct answer from the drop-down menu.

Given the function

$$f(x) = x^5 + 5x^3 + x + 2$$

, find the derivative of the inverse function

f

at

$$x = 9$$

.

$$g'(9) =$$

$$\frac{1}{21}$$
✓
▼

QUESTION 7



Choose the correct answer from the drop-down menu.

Given the graph of the function

$$f(x)$$

and its inverse

$$g(x)$$

, find the derivative of the inverse of

$$f(x)$$

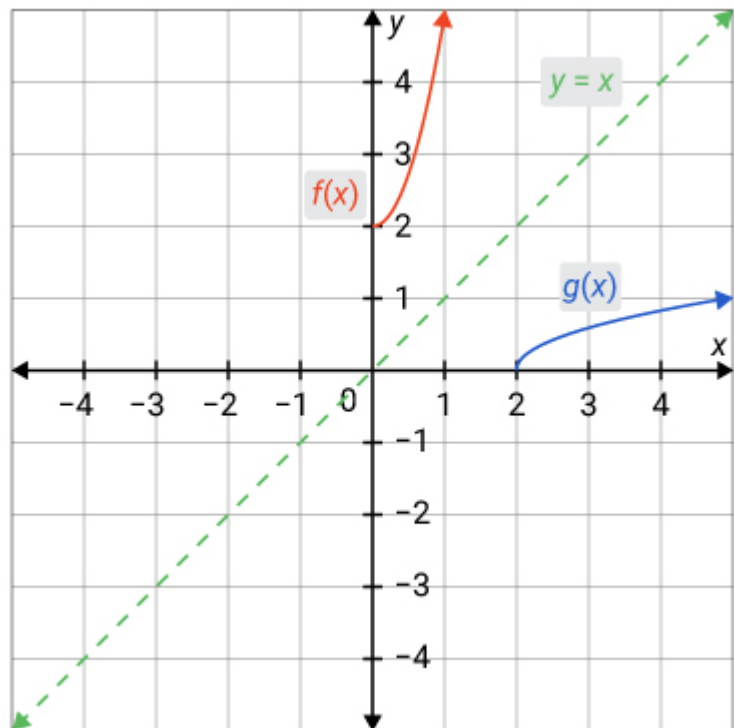
. The inverse is a reflection across the line

$$y = x$$

. Notice that

$$f(x)$$

is one-to-one on this interval only, and thus has an inverse function.



$$f(x) = 3x^2 + 2$$

for

$$x \geq 0$$

$$g'(x) =$$

$$\frac{1}{6 \left(\frac{x-2}{3} \right)^{1/2}} \quad \checkmark \quad \blacktriangledown, \text{ for}$$

$$x > 2$$

.

QUESTION 8



Select the correct option.

Given the function

$$f(x) = \sqrt{x^3 + 2x + 4}$$

, what is the derivative of the inverse function

f

at

$$x = 4$$

?



$$g'(4) = \frac{7}{4}$$

$$g'(4) = \frac{4}{7}$$



$$g'(4) = \frac{1}{14}$$

☐ $g'(4) = 14$

QUESTION 9



Select the correct option.

Given the graph of the function

$$f(x)$$

and its inverse

$$g(x)$$

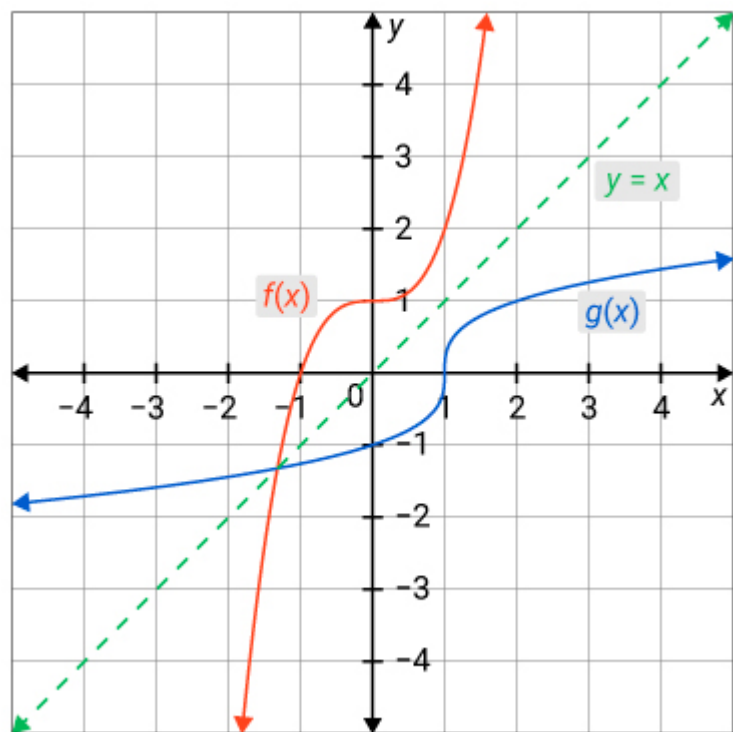
, find the derivative of the inverse of $f(x)$

.

Notice how the graph of $f(x)$

is one-to-one without domain restriction.

$$f(x) = x^3 + 1$$



Which of the following is the correct equation for

$$g'(x)$$

?



$$g'(x) = \frac{1}{3\sqrt{x-1}}$$

,

☐ $x \neq 1$



$$g'(x) = \frac{1}{3\sqrt[3]{x-1}}$$

$x \neq 1$



$$g'(x) = \frac{1}{3(x-1)^{2/3}}$$

$x \neq 1$



$$g'(x) = \frac{1}{3(x^3-1)^2}$$

$x \neq 1$

QUESTION 10



Select the correct option.

Recall that the slope of

$$f(x)$$

at a point

$$(x, y)$$

and the slope of

$$g(x)$$

at

$$(y, x)$$

are reciprocal, use the graph below to determine the slope of the inverse of the function at the point given.

Using the graph of

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

, determine the slope of

$$g(x)$$

at the point

$$(5, 2)$$

.

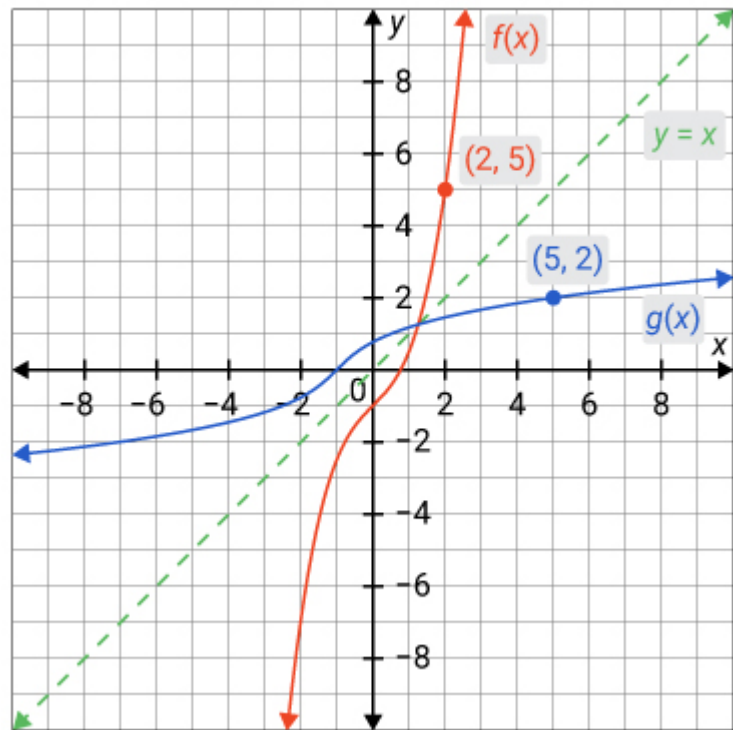
What is the slope of

$$g(x)$$

at the point

$$(5, 2)$$

?



$$g'(5) = 41.5$$



$$g'(5) = 2$$

$$g'(5) = \frac{1}{7}$$





$$g'(5) = 7$$

QUESTION 11



Select the correct option.

If

$$f(2) = 5$$

and

$$f'(2) = 23$$

, what is the value of

$$g'(5)$$

where function

$$g(x)$$

is the inverse of

$$f(x)$$

?



$$g'(5) = 23$$



$$g'(5) = \frac{1}{2}$$

$$g'(5) = \frac{1}{23}$$



☐ $g'(5) = \frac{1}{5}$

QUESTION 12



Select the correct option.

If

$$f(3) = 10$$

and

$$f'(x) = \frac{2x^3 + 4x^2}{5x + 5}$$

, what is the value of

$$g'(10)$$

, where function

$$g(x)$$

is the inverse of

$$f(x)$$

?

☒ $g'(10) = \frac{2}{9}$



☐ $g'(10) = 10$

☐ $g'(10) = 3$

☐ $g'(10) = \frac{9}{2}$

QUESTION 13



Select the correct option.

The formula to convert temperature from Celsius,

C

, into Fahrenheit,

F

, is

$$C = \frac{5}{9}(F - 32)$$

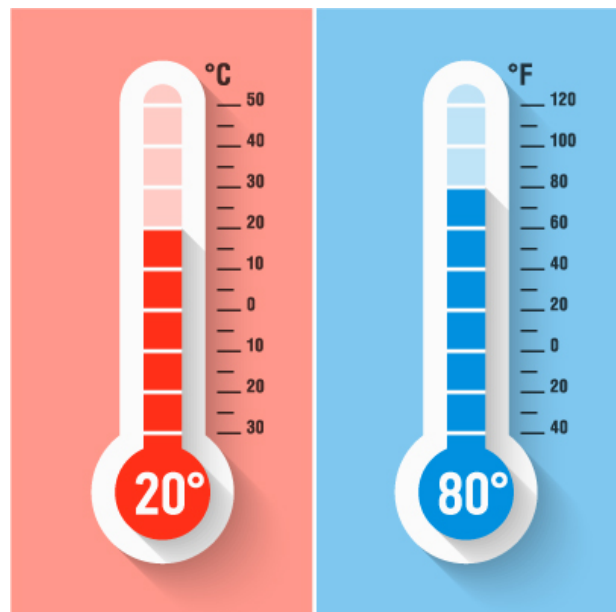
. What is the inverse function for

F

in terms of

C

?



☐ $F = \frac{5}{9}C + 32$

☒ $F = \frac{9}{5}C + 32$



☐ $F = \frac{9}{5}C - 32$

☐ $F = \frac{9}{5}(C + 32)$

QUESTION 14



Select the correct option.

What is the derivative of the inverse of

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

,

$$x \geq 0$$

?

☒ $g'(x) = \frac{1}{4x^{1/2}}$



☐ $g'(x) = \frac{1}{4x^2}$

☐ $g'(x) = \frac{1}{8x^{1/2}}$

☐ $g'(x) = \frac{4}{x^{1/2}}$

QUESTION 15



Find the equation to the tangent line at $x = 8$

of

$g(x)$

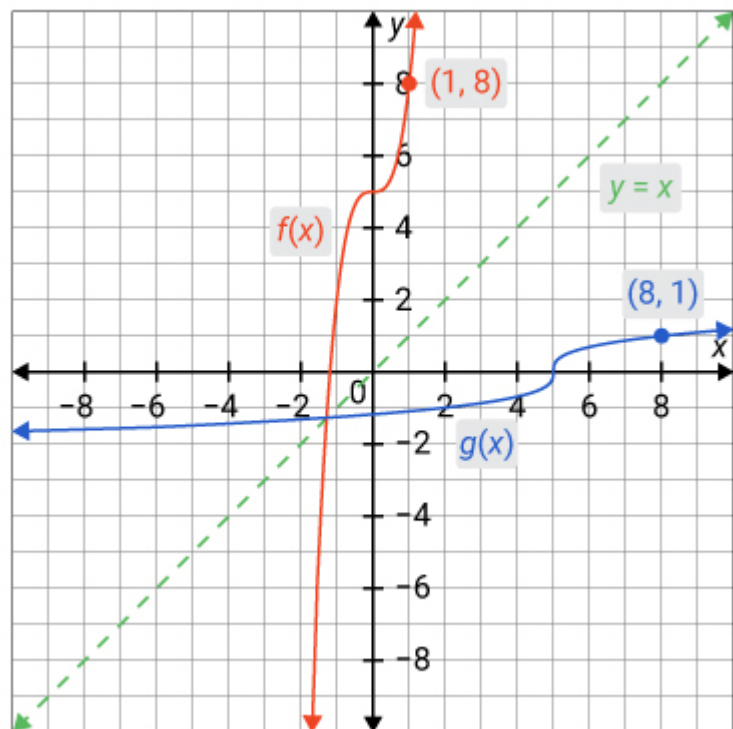
, where

$g(x)$

is the inverse function of

$f(x) = 3x^3 + 5$

. Select all that apply.



☒ $y = \frac{1}{9}x + \frac{1}{9}$



☒ $y = \frac{1}{9}(x - 8) + 1$



☐ $y = \frac{1}{9}(x - 8) - 1$



$$y = \frac{1}{9}(x + 8) + 1$$

$$y - 1 = \frac{1}{9}(x - 8)$$

