PRINTABLE VERSION

Practice Test 2

You scored 100 out of 100

Question 1

Your answer is CORRECT.

Given the following functions, find the domain of f/g.

$$f(x) = 5x^2 - 2x$$
$$g(x) = x^2 + 2x - 24$$

$\frac{f}{g} = \frac{f(x)}{g(x)} = \frac{5x^2 - 2x}{x^2+2x-24} = \frac{x(5x-2)}{(x-4)(x+6)}$

$x \neq 4 \quad x \neq -6$

a) (●) $(-\infty, -6) \cup (-6, 4) \cup (4, \infty)$

b) ( ) $(-\infty, 2/5) \cup (2/5, \infty)$

c) ( ) $(-\infty, -6] \cup [4, \infty)$

d) ( ) $(-\infty, -6) \cup (4, \infty)$

e) ( ) $(-\infty, -4) \cup (-4, 6) \cup (6, \infty)$

f) ( ) None of the above.

$(-\infty, -6) \cup (-6, 4) \cup (4, \infty)$

Question 2

Your answer is CORRECT.

Find the domain of the following function.

$$f(x) = \frac{\sqrt{x+6}}{x-2}$$

$x + 6 \geq 0$

$x \geq -6$

$x - 2 \neq 0$

$x \neq 2$

a) ( ) $(-\infty, 2) \cup (2, \infty)$

b) ( ) (∞, ∞)

c) ( ) $[-6, \infty)$

d) (●) $[-6, 2) \cup (2, \infty)$

$[-6, 2) \cup (2, \infty)$

e) $(-6, 2) \cup (2, \infty)$

f) None of the above.

Question 3

Your answer is CORRECT.

Given the following function, identify any vertical asymptotes. ALWAYS, FACTOR FIRST!

$$f(x) = \frac{3x^2 - 9x}{6x^2 - 54} = \frac{3x(x-3)}{6(x^2-9)} = \frac{3x(x-3)}{6(x+3)(x-3)}$$

$$= \frac{3x}{6(x+3)}$$

a) $x = \frac{1}{2}$

b) $x = -3$

c) None.

d) $x = 3$

e) $x = 0$

$x + 3 = 0$

$x = -3$

f) None of the above.

Question 4

Your answer is CORRECT.

Given the following function, identify any holes.

Hole at $x = 3$

$$f(x) = \frac{3x^2 - 9x}{6x^2 - 54}$$

$$f(x) = \frac{3x^2 - 9x}{6x^2 - 54} = \frac{3x(x-3)}{6(x^2-9)} = \frac{3x(x-3)}{6(x+3)(x-3)}$$

a) $\left(-3, \frac{1}{4}\right)$

b) $\left(3, \frac{1}{4}\right)$

$f(x)_{new} = \frac{3x}{6(x+3)}$

Hole: $(3, 1/4)$

c) None.

d) $(3, 0)$

$$f(3)_{new} = \frac{3(3)}{6(3+3)} = \frac{9}{6(6)} = \frac{9}{36} = \frac{1}{4}$$

e) $(-3, 0)$

f) None of the above.

Question 5

Your answer is CORRECT.

Let

$$f(x) = \frac{2x-2}{6x+3}$$

Find the y-intercept of

$f(2x+3)$

↳ $x = 0$

$f(2(0)+3) = f(3)$

$$f(3) = \frac{2(3)-2}{6(3)+3} = \frac{6-2}{18+3} = \frac{4}{21}$$

$(0, 4/21)$

a) $\left(0, \frac{2}{15}\right)$

b) $\left(0, \frac{4}{21}\right)$

c) $\left(0, \frac{1}{3}\right)$

d) $\left(0, \frac{8}{15}\right)$

e) $\left(0, -\frac{2}{3}\right)$

f) None of the above.

Question 6

Your answer is CORRECT.

The graph of the function

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

has a horizontal asymptote. If the graph crosses this asymptote, give the x-coordinate of the intersection. Otherwise, state that the graph does not cross the asymptote.

a) $x = \frac{11}{4}$

b) $x = -5$

c) $x = -\frac{5}{4}$

d) $x = -\frac{11}{4}$

e) The graph does not cross the asymptote.

f) None of the above.

HA: $y = \frac{1}{2}$

$\frac{x^2+4x+4}{2x^2+4x+3} = \frac{1}{2}$ Cross-Product

$2(x^2+4x+4) = 2x^2+4x+3$

$2x^2+8x+8 = 2x^2+4x+3$

$4x = -5$

$x = -5/4$

Question 7 (Look at the end of this practice test for a similar question.)

Your answer is CORRECT.

Given the following function, find $f \circ g$.

$$f(x) = 1$$

$$g(x) = 2x - 4$$

a) 2

b) −2

c) 1

d) $5 - 2x$

e) −4

f) None of the above.

$f \circ g : f(g(x)) = f(2x-4) = 1$

To find gof:

$(gof)(x) = g(f(x)) = 2 \cdot f(x) + 4$

$= 2 \cdot 1 + 4 = 6$

Question 8

Your answer is CORRECT.

Given

$$f(x) = x^2 + 4x + 1$$

find the difference quotient

$$\frac{f(x+h)-f(x)}{h}, \quad h \neq 0$$

and evaluate when $x = 1$.

a) $-6+h$

b) $\frac{6+7h+h^2}{h}$

c) $\frac{6+6h+h^2}{h}$

d) $6+h$

e) $5+h$

f) None of the above.

I. $f(x+h) = (x+h)^2 + 4(x+h) + 1$ ← Substitute & Simplify

$= x^2 + 2hx + h^2 + 4x + 4h + 1$ ✓

Subtract & Simplify

II. $f(x+h) - f(x) = x^2 + 2hx + h^2 + 4x + 4h + 1 - (x^2 + 4x + 1)$

$= 2hx + h^2 + 4h$ ✓

Put in fraction & Simplify

III. $\frac{f(x+h) - f(x)}{h} = \frac{2hx + h^2 + 4h}{h} = \frac{h(2x+h+4)}{h} = 2x+h+4$

Evaluate at $x = 1$

When $x=1$ $2 \cdot 1 + 4 + h = \boxed{6+h}$

Question 9

Your answer is CORRECT.

Given

$$f(x) = x^3 - 4x + 8$$

find the difference quotient

$$\frac{f(x+h)-f(x)}{h}, \quad h \neq 0$$

a) $x^2 + 4x + h$

b) $3x^2 + 3hx + h^2 - 4$

c) $\frac{x^3 + 3hx^2 + 3xh^2 + h^3 - 4x - 3h + 8}{h}$

d) $\frac{x^3 + 3hx^2 + 3xh^2 + h^3 - 4x - 4h + 8}{h}$

Steps in the addended page!

$f(x) = x^3 - 4x + 8$

$(x+h)(x+h)(x+h)$ FOIL ← $(x+h)^3$

I. $f(x+h) = (x+h)^3 - 4(x+h) + 8$

$(x^2+2hx+h^2)(x+h)$

$f(x+h) = x^3+3hx^2+3h^2x+h^3-4x-4h+8$

$x^3 + x^2h + 2hx^2 + 2h^2x + h^2x + h^3$

$x^3 + 3hx^2 + 3h^2x + h^3$

II. $f(x+h) - f(x) = x^3+3hx^2+3h^2x+h^3-4x-4h+8 - (x^3-4x+8)$

$= 3hx^2 + 3h^2x + h^3 - 4h$

III. $\dfrac{f(x+h) - f(x)}{h} = \dfrac{3hx^2+3h^2x+h^3-4h}{h} = \dfrac{h(3x^2+3hx+h^2-4)}{h}$

$= \boxed{3x^2+3hx+h^2-4}$

Question 9 (Another Version for Difference Quotient)

Given

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

find the difference quotient

$$\frac{f(x+h)-f(x)}{h}, \quad h\neq 0$$

a) $\dfrac{x+h+2}{(x+h-1)\,h}$

b) $\dfrac{3}{(x-h-1)\,(-1+x)}$

c) $\dfrac{x+2+hx+h^2}{h\,(x+h-1)}$

d) x^2-2x+h

e) ● $-\dfrac{3}{(x+h-1)\,(-1+x)}$

f) None of the above.

I. $f(x+h)=\dfrac{(x+h)+2}{(x+h)-1}$

II. $f(x+h)-f(x)=\dfrac{x+h+2}{x+h-1}-\dfrac{x+2}{x-1}$

$=\dfrac{(x+h+2)(x-1)}{(x+h-1)(x-1)}-\dfrac{(x+2)(x+h-1)}{(x-1)(x+h-1)}$ (FOIL)

$=\dfrac{(x^2-x+xh-h+2x-2)-(x^2+xh-x+2x+2h-2)}{(x+h-1)(x-1)}$

$=\dfrac{x^2-x+xh-h+2x-2-x^2-xh+x-2x-2h+2}{(x+h-1)(x-1)}$

$=\dfrac{-3h}{(x+h-1)(x-1)}$

III. $\dfrac{f(x+h)-f(x)}{h}=\dfrac{\dfrac{-3h}{(x+h-1)(x-1)}}{h}$

$=\boxed{\dfrac{-3}{(x+h-1)(x-1)}}$

e) $-3x^2 + 3hx - h^2 + 4$

f) None of the above.

Question 10

Your answer is CORRECT.

Assume the domains of f and f^{-1} are $(-\infty, 4/3) \cup (4/3, \infty)$. Solve for x, given that

$$f^{(-1)}\left(\frac{4x+3}{3x-4}\right) = 6$$

and

$$f(6) = \frac{1}{6}$$

f	x	y
	$\frac{4x+3}{3x-4}$	6
	6	$\frac{1}{6}$

f^{-1}	x	y
	6	$\frac{4x+3}{3x-4}$
	$\frac{1}{6}$	6

a) $-\frac{22}{21}$

b) $\frac{20}{21}$

c) $-\frac{1}{21}$

d) $-\frac{43}{21}$

e) $-\frac{64}{21}$

f) *None of the above.*

$\frac{4x+3}{3x-4} = \frac{1}{6}$ Cross-Product

$6(4x+3) = 3x-4$

$24x + 18 = 3x - 4$

$21x = -22$

$x = \frac{-22}{21}$

Question 11

Your answer is CORRECT.

Find the inverse of the given function, if possible.

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

where $x \geq 0$ ← Domain makes f one-to-one invertible

a) $f^{-1}(x) = 4\sqrt{x} + 2$

b) $f^{-1}(x) = \frac{1}{2}\sqrt{x+8}$

c) $f(x)$ does not have an inverse.

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

e) $f^{-1}(x) = -4\sqrt{x} - 2$

Rewrite
I. $y = 4x^2 - 2$

Exchange
II. $x = 4y^2 - 2$

Solve for y
III. $\frac{x+2}{4} = \frac{4y^2}{4}$

$y = \sqrt{\frac{x+2}{4}} = \frac{\sqrt{x+2}}{\sqrt{4}} = \frac{\sqrt{x+2}}{2}$

IV. Answer

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

Question 12

Your answer is CORRECT.

Find the coordinates of the center for the given circle.

$$x^2 + 10x + 25 + y^2 - 14y = 0$$

a) (-5, -7)

b) (7, -5)

c) (-5, 7)

d) (5, -7)

e) (-7, 5)

$x^2 + 10x + 5^2 + y^2 - 14y + (-7)^2 = -25 + 5^2 + (-7)^2$

$(x+5)^2 + (y-7)^2 = 49$

Center : $(-5, 7)$

Question 13

Your answer is CORRECT.

Find the coordinates of the center for the given hyperbola.

$$-9x^2 - 108x - 452 + 16y^2 + 32y = 0$$

a) (6, 1)

b) (-6, 1)

c) (1, 6)

d) (-1, -6)

$-9(x^2 + 12x + 6^2) + 16(y^2 + 2y + 1^2) = 452 + (-9)6^2 + (16)1^2$

$-9(x+6)^2 + 16(y+1)^2 = 452 - (9)(36) + 16$

$\frac{-9(x+6)^2}{144} + \frac{16(y+1)^2}{144} = \frac{144}{144}$

e) (-6, -1)

$\frac{-(x+6)^2}{16} + \frac{(y+1)^2}{9} = 1$ Center: $(-6, -1)$

Question 14

Your answer is CORRECT.

Complete the square to write the equation in the standard form $f(x) = a(x - h)^2 + k$.

State the coordinates of the vertex of the parabola.

$$f(x) = -5x^2 + 60x - 178$$

a) (6, −2)

b) (−6, 2)

c) (0, 2)

d) (−30, 2)

e) (6, 2)

$= -5(x^2 - 12x + 6^2) - 178 + 5 \cdot 6^2$

$= -5(x-6)^2 - 178 + 180$

$y = -5(x-6)^2 + 2$

$\Rightarrow$ Vertex = $(6, 2)$

Question 15

Your answer is CORRECT.

Complete the square to write the equation in the standard form $f(x) = a(x - h)^2 + k$.

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

a) $f(x) = -\frac{1}{2}(x-2)^2 + 6$

b) $f(x) = -\frac{1}{2}(x+2)^2 + 6$

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

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

e) $f(x) = -\frac{1}{2}(x-4)^2 + 2$

$f(x) = \frac{-1}{2}(x^2 + 4x + 2^2) - (-\frac{1}{2})(2^2)$

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

Question 16

Your answer is CORRECT.

State the equations of the asymptotes for the following:

$$\frac{(y-5)^2}{(9)} - \frac{(x-1)^2}{(16)} = 1$$

a^2 → (9) ↑ b^2 (16)

Vertical Hyperbola ↔ $y = \frac{a}{b}x$

a) $\{y+5=3x-3,\quad y+5=-3x+3\}$

b) $\{y+5=4x-4,\quad y+5=-4x+4\}$

c) $\{y=5,\quad x=1\}$

d) $\left\{y-5=\frac{3}{4}x-\frac{3}{4},\quad y-5=-\frac{3}{4}x+\frac{3}{4}\right\}$

e) $\left\{y-5=\frac{4}{3}x-\frac{4}{3},\quad y-5=-\frac{4}{3}x+\frac{4}{3}\right\}$

$y-5=\pm\frac{3}{4}(x-1)$

$y-5=\frac{3}{4}(x-1) \rightarrow y-5=\frac{3}{4}x-\frac{3}{4}$

$y-5=\frac{-3}{4}(x-1)$

$y-5=\frac{-3}{4}x+\frac{3}{4}$

Question 17

Your answer is CORRECT.

Graph the following system of equations. How many points of intersection are there?

$$x^2+y^2=25$$

$$\frac{x^2}{(9)}+\frac{y^2}{(36)}=1$$

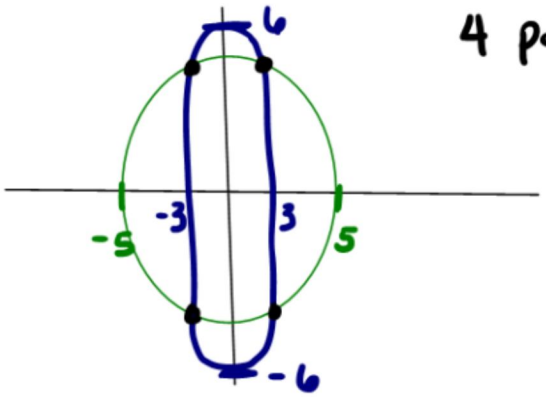
a) 0

b) 1

c) 4

d) 6

e) 2



4 points of intersection

Question 18

Your answer is CORRECT.

Find the *x*-coordinate(s) of the point(s) of intersection for the following equations:

$9x^2 + 3y^2 = 7$

$(-1)(9x^2 - y^2 = 6)$

$9x^2 + 3y^2 = 7$

$-9x^2 + y^2 = -6$

$4y^2 = 1$

$y^2 = \frac{1}{4}$

$y = \pm\frac{1}{2}$

$9x^2 - \left(\frac{1}{2}\right)^2 = 6$

$9x^2 - \frac{1}{4} = 6$

$9x^2 = 6 + \frac{1}{4}$

$9x^2 = \frac{24+1}{4}$

$9x^2 = \frac{25}{4}$

$x^2 = \frac{25}{36}$

$x = \pm\frac{5}{6}$

$\{-5/6, 5/6\}$

a) $\left\{\frac{5}{6}, \frac{5}{12}\right\}$

b) $\left\{-\frac{5}{3}, \frac{5}{3}\right\}$

c) $\left\{-\frac{59}{6}, -\frac{49}{6}\right\}$

d) $\left\{-\frac{5}{6}, \frac{5}{6}\right\}$

e) $\left\{\frac{1}{6}, \frac{5}{6}\right\}$

Question 19

Your answer is CORRECT.

State the translation of the key point (0, 0).

$f(x) = |x - 2| + 5$

right 2

up 5

a) (5, 2)

b) (2, -5)

c) (2, 5)

d) (-2, -5)

e) (-2, 5)

(0, 0) → (2, 0) right 2

(2, 0) → (2, 5) up 5

Question 20

Your answer is CORRECT.

Given the following function, find the x-intercept(s).

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

$y = 0$

$5 - x = 0$

$x - 4 = 0$

a) $(-5, 0), (4, 0)$

b) (5, 0), (4, 0)

c) (0, −320)

d) (−5, 0), (16, 0)

e) (5, 0), (−4, 0)

$5 - x = 0$

$x = 4$

$5 = x$

x-int → (5,0) (4,0)

How to find y-intercept?

$x = 0$

$f(0) = (5-0)(0-4)$

$= -20$

y-int (0, −20)

Question 21

Your answer is CORRECT.

Find the inverse of the given function, if possible.

$$f(x) = \frac{6x+3}{2x+2}$$

a) $f^{-1}(x) = \frac{2x-2}{6x+3}$

b) $f^{-1}(x) = \frac{-3+2x}{6-2x}$

c) $f(x)$ does not have an inverse.

d) $f^{-1}(x) = \frac{3x+6}{2x+2}$

e) $f^{-1}(x) = \frac{6x-3}{2x+2}$

I. $y = \frac{6x+3}{2x+2}$ Rewrite

II. $\frac{x}{1} = \frac{6y+3}{2y+2}$ Exchange

III. Solve

$2xy + 2x = 6y + 3$

$2xy - 6y = 3 - 2x$

$y(2x-6) = 3-2x$

$y = \frac{3-2x}{2x-6} \cdot \frac{-1}{-1}$ ← multiply by 1

$y = \frac{2x-3}{6-2x}$

$f^{-1}(x) = \frac{2x-3}{6-2x}$

Answer

Question 22

Your answer is CORRECT.

Find the inverse of the given function, if possible.

$f(x) = \sqrt{5+2x}$ ⇒ dom f = $[-\frac{5}{2}, \infty)$, range f = $[0, \infty)$

a) $f^{-1}(x) = (5+2x)^2, \frac{5}{2} \le x$

b) $f^{-1}(x) = (2x-5)^2, -\frac{5}{2} \le x$

c) $f(x)$ does not have an inverse.

$y = \sqrt{5+2x}$

$x = \sqrt{5+2y}$

$x^2 = 5+2y$

$\frac{x^2-5}{2} = \frac{2y}{2}$

$y = \frac{x^2-5}{2}$

not 1-1

Restrict domain

d) $f^{-1}(x) = -\frac{5}{2} + \frac{1}{2}x^2, \ 0 \le x$

e) $f^{-1}(x) = \frac{5}{2} - \frac{1}{2}x^2, \ 0 \le x$

$y = \frac{x^2 - 5}{2}$

$y = \frac{1}{2}x^2 - \frac{5}{2}$

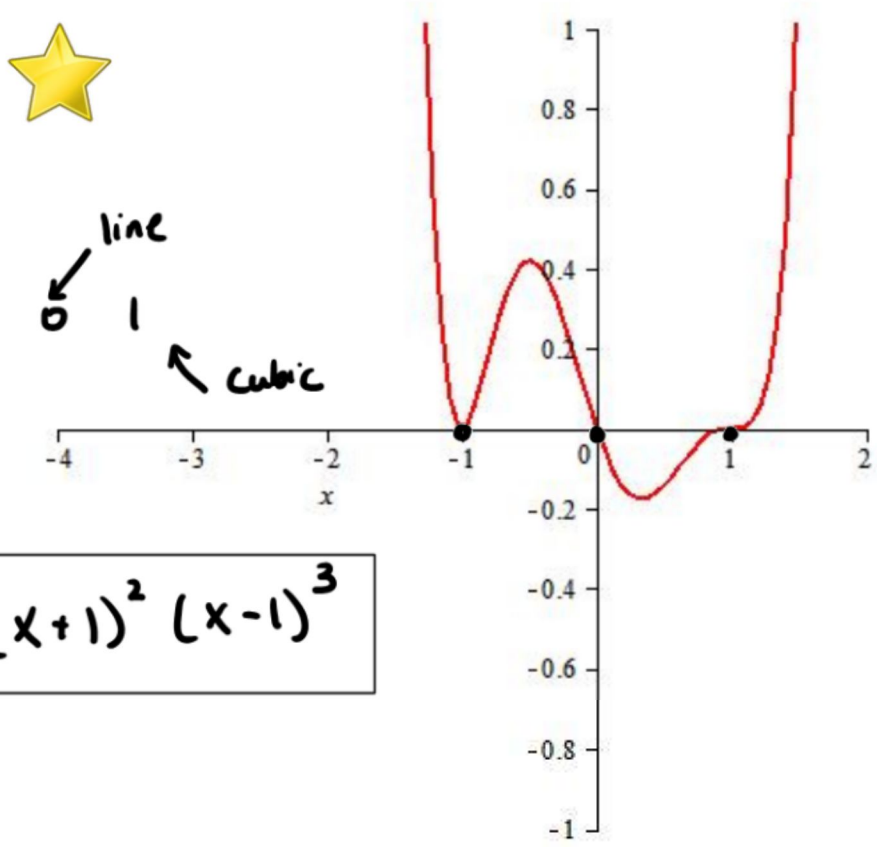
$f^{-1}(x) = \frac{1}{2}x^2 - \frac{5}{2}$, where $x \geq 0$

(Don't forget: domain f^{-1} = range f)

Question 23

Your answer is CORRECT.

Which of the following functions will generate the graph shown below?



even (+)

zeros: -1, 0, 1

line

cubic

parabola

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

a) $f(x) = (x-1)^2(x+1)^2x^2$

b) $f(x) = x^2(x-1)^2$

c) $f(x) = (x-1)^3(x+1)^2x$

d) $f(x) = (x-1)^5x$

e) $f(x) = (x-1)(x+1)^2x$

f) None of the above.

Question 24

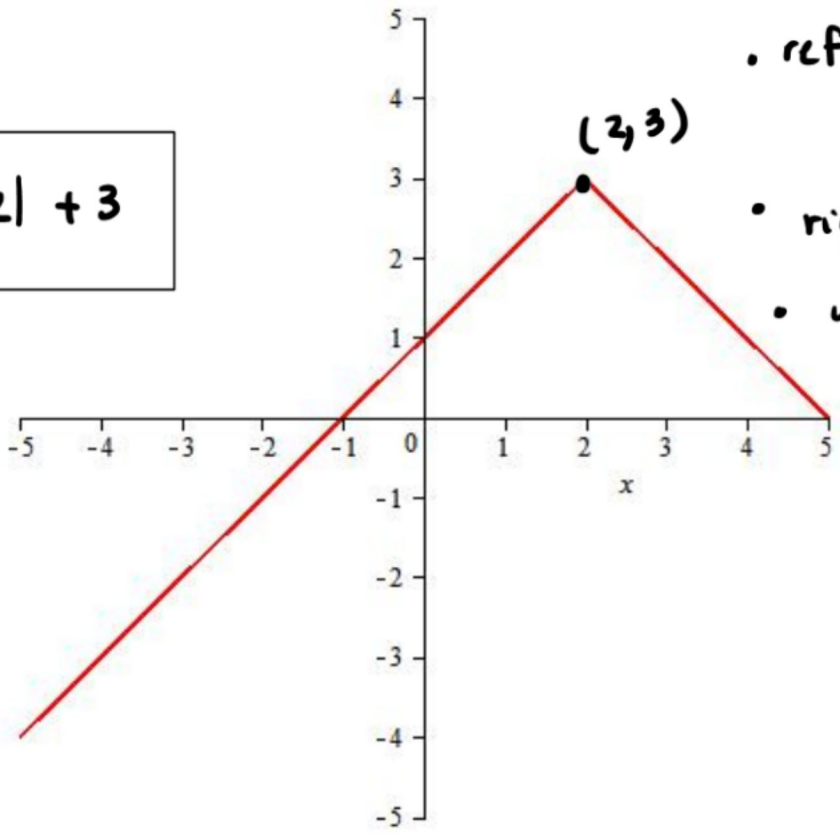
Your answer is CORRECT.

Which function generates the graph below? The point (2 , 3) is on the graph.

parent: $|x|$

$f(x) = -|x-2| + 3$

- reflect about x
- right 2
- up 3



a) $f(x) = |x + 2| + 3$

b) $f(x) = -|x + 2| + 3$

c) $f(x) = -|x - 2| - 3$

d) $f(x) = -|x - 2| + 3$

e) $f(x) = |x - 2| + 3$

f) None of the above.

Question 25

Your answer is CORRECT.

Find the linear function f with y-intercept -3 and $f^{-1}(-5) = 6$.

y-int = -3 $\Leftrightarrow$ (0, -3)

$f^{-1}(-5) = 6 \Leftrightarrow f(6) = -5$

a) $f(x) = -\frac{1}{3}x - 3$

b) $f(x) = -\frac{9}{5}x - 3$

c) $f(x) = \frac{1}{3}x + 3$

d) $f(x) = -3x - 3$

e) $f(x) = -\frac{9}{5}x + 3$

f) None of the above.

$(0, -3)$ $(6, -5)$ ← Two points

$\frac{\Delta y}{\Delta x} = \frac{-5 - (-3)}{6 - 0} = \frac{-2}{6} = -\frac{1}{3}$ ← slope

$y + 3 = -\frac{1}{3}x$ ← equation

$$y = -\frac{1}{3}x - 3$$

Question 7 (Another Version)

Given the following function, find $g \circ f$.

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

$$g(x) = 5x - 4$$

a) $\frac{10x}{x-2} + \frac{10}{x-2} - 8$

b) $\frac{5x}{5x-6} - \frac{3}{5x-6}$

c) $\frac{10x}{5x-6} - \frac{6}{5x-6}$

d) $\frac{5x}{x-2} + \frac{5}{x-2} - 4$

e) $\frac{x+1}{x-2} - 5x + 4$

f) None of the above.

$(g \circ f)(x) = g(f(x))$

$= 5 \cdot f(x) - 4$

$= 5 \cdot \frac{x+1}{x-2} - 4$

$= \frac{5(x+1)}{x-2} - 4 = \frac{5x+5}{x-2} - 4$

Rewrite to match

$= \frac{5x}{x-2} + \frac{5}{x-2} - 4$

$\Rightarrow (g \circ f)(x) = \frac{5x}{x-2} + \frac{5}{x-2} - 4$