

$\Rightarrow$  DOMAIN IS ALL REAL NUMBERS EXCEPT  $x = -2$  AND  $x = -1$

Module 7 - Rational Functions

Progress Exam 2

31. Determine the domain of the function below.

$$f(x) = \frac{3}{12x^2 + 36x + 24} = \frac{3}{12(x^2 + 3x + 2)} = \frac{3}{12(x+2)(x+1)}$$

- A. All Real numbers.  
 B. All Real numbers except  $x = a$  and  $x = b$ , where  $a \in [-1.4, -0.9]$  and  $b \in [-3.2, -1.3]$   
 C. All Real numbers except  $x = a$ , where  $a \in [-17.1, -15.6]$   
 D. All Real numbers except  $x = a$ , where  $a \in [-1.4, -0.9]$   
 E. All Real numbers except  $x = a$  and  $x = b$ , where  $a \in [-17.1, -15.6]$  and  $b \in [-20, -17.3]$

$$\begin{aligned} x+2 &\neq 0 \\ x &\neq -2 \end{aligned}$$

$$\begin{aligned} x+1 &\neq 0 \\ x &\neq -1 \end{aligned}$$

32. Choose the equation of the function graphed below.

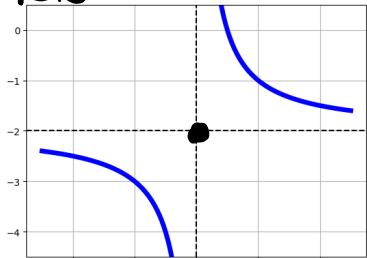
\*PARENT FUNCTION  
IS  $\frac{1}{x}$

\* $a > 0 \Rightarrow a = 1$

\* $(h, k) = (2, -2)$

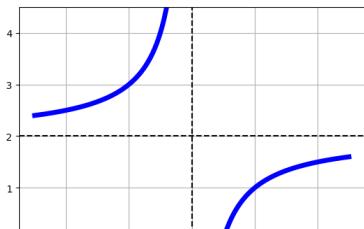
$$f(x) = \frac{1}{x-h} + k$$

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



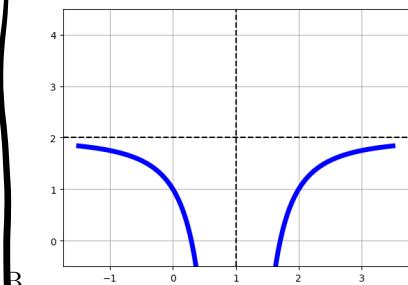
33. Choose the graph of the equation below.

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



There was an error in how this question was generated. Based on the shape of the graph ( $1/x$ ) the answer is C.

A.



B.

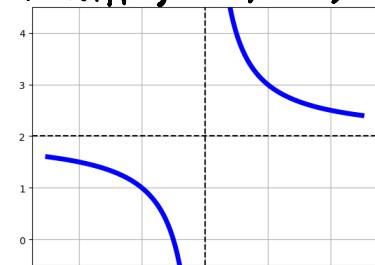
- A.  $f(x) = \frac{1}{x+2} + 2$   
 B.  $f(x) = \frac{-1}{x-2} + 2$   
 C.  $f(x) = \frac{-1}{(x-2)^2} + 2$   
 D.  $f(x) = \frac{1}{(x+2)^2} + 2$

There was an error in how this question was generated. Based on the shape of the graph ( $1/x$ ) the answer is A.

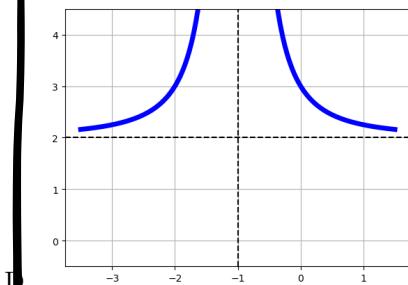
\*PARENT FUNCTION IS  $\frac{1}{x}$

\* $a = 1 \Rightarrow a > 0$

\* $(h, k) = (1, -2)$



C.



D.

34. Solve the rational equation below. Then, choose the interval(s) that the solution(s) belongs to.

$$-2 + \frac{2}{8x-5} = \frac{-6}{-64x+40}$$

- A. All solutions lead to invalid or complex values in the equation.
- B.  $x \in [0.3, 0.9]$
- C.  $x_1 \in [-1, 0.6]$  and  $x_2 \in [-4, 2]$
- D.  $x_1 \in [1, 1.2]$  and  $x_2 \in [-4, 2]$
- E.  $x \in [-1, 0.6]$

35. Solve the rational equation below. Then, choose the interval(s) that the solution(s) belongs to.

$$\frac{2x}{2x-3} - \frac{5x^2}{-4x^2 + 18x - 18} = -\frac{3}{-2x+6}$$

\*LCD IS  $(2x-3)(-2x+6)$

- A.  $x_1 \in [0, 1.6]$  and  $x_2 \in [-2, 7]$
- B. All solutions lead to invalid or complex values in the equation.
- C.  $x \in [0, 1.6]$
- D.  $x \in [0, 1.6]$
- E.  $x_1 \in [1.7, 4.2]$  and  $x_2 \in [-2, 7]$

$$\left[ \frac{2x}{2x-3} - \frac{5x^2}{(2x-3)(-2x+6)} = -\frac{3}{-2x+6} \right] (2x-3)(-2x+6)$$

$$2x(-2x+6) - 5x^2 = -3(2x-3)$$

$$-4x^2 + 12x - 5x^2 = -6x + 9$$

$$-9x^2 + 12x = -6x + 9$$

$$0 = 9x^2 - 18x + 9$$

$$0 = 9(x^2 - 2x + 1)$$

$$0 = 9\underline{(x-1)}\underline{(x-1)}$$

$$x-1=0$$

$$\boxed{x=1}$$

$x=1$  IS IN THE DOMAIN!

↑ DOMAIN:

$$2x-3 \neq 0$$

$$-2x+6 \neq 0$$

$$2x \neq 3$$

$$-2x \neq -6$$

$$x \neq \frac{3}{2}$$

$$x \neq 3$$

DOMAIN IS ALL REAL  
NUMBERS EXCEPT  $\frac{3}{2}$  AND 3

34.

$$-2 + \frac{2}{8x-5} = \frac{-6}{-64x+40}$$

$$\Rightarrow \left( -2 + \frac{2}{8x-5} = \frac{-6}{-8(8x-5)} \right) (-8(8x-5))$$

$$-2(-8(8x-5)) + 2(-8) = -6$$

$$16(8x-5) - 16 = -6$$

$$128x - 80 - 16 = -6$$

$$128x - 96 = -6$$

$$\underline{+96 = +96}$$

$$\frac{128x}{128} = \frac{90}{128}$$

$$x = 0.703$$

↗ IN THE DOMAIN!

DOMAIN:

$$8x-5 \neq 0$$

$$8x \neq 5$$

$$x \neq \frac{5}{8} \Rightarrow x \neq 0.625$$

DOMAIN IS ALL REAL  
NUMBERS EXCEPT 0.625

36. Which of the following intervals describes the Range of the function below?

$$f(x) = -\log_2(x + 9) - 7$$

- A.  $[a, \infty)$ ,  $a \in [-9.53, -8.32]$
- B.  $(-\infty, a)$ ,  $a \in [6.24, 8.99]$
- C.  $(-\infty, a]$ ,  $a \in [8.96, 9.66]$
- D.  $(-\infty, a)$ ,  $a \in [-7.99, -5.82]$
- E.  $(-\infty, \infty)$

**★ RANGE OF LOGARITHM FUNCTIONS  
IS ALWAYS  $(-\infty, \infty)$**

37. Which of the following intervals describes the Range of the function below?

$$f(x) = -e^{x+8} + 5$$

- A.  $[a, \infty)$ ,  $a \in [-7, -2]$
- B.  $(a, \infty)$ ,  $a \in [-7, -2]$
- C.  $(-\infty, a]$ ,  $a \in [4, 14]$
- D.  $(-\infty, a)$ ,  $a \in [4, 14]$
- E.  $(-\infty, \infty)$

**★ RANGE OF  $f(x) = b^{x+c} + d$  IS  
 $(d, \infty)$  IF  $b > 0$  AND  $(-\infty, d)$  IF  $b < 0$   
⇒ RANGE IS  $(-\infty, 5)$**

38. Solve the equation for  $x$  and choose the interval that contains the solution (if it exists).

$$\log_4(3x + 7) + 5 = 3$$

- A.  $x \in [-4.2, -1.1]$
- B.  $x \in [-0.1, 3.5]$
- C.  $x \in [17.9, 22.2]$
- D.  $x \in [4.8, 11.9]$

E. There is no Real solution to the equation.

$$\begin{array}{rcl} -5 = -5 \\ \hline \log_4(3x+7) = -2 \end{array}$$

TO

**"4 TO THE -2 EQUALS**

$$4^{-2} = 3x + 7$$

$$\frac{1}{4^2} = 3x + 7$$

$$\begin{array}{rcl} \frac{1}{16} = 3x + 7 \\ -7 = -7 \\ \hline \frac{1}{16} - 7 = 3x \end{array}$$

$$-6.9375 = 3x$$

$$x = -2.3125$$

$$\ln(e^x) = x$$

## Module 8 - Logarithmic and Exponential Equations

## Progress Exam 2

39. Solve the equation for  $x$  and choose the interval that contains  $x$  (if it exists).

- A.  $x \in [-36, -32]$
- B.  $x \in [14, 22]$
- C.  $x \in [-19, -15]$
- D.  $x \in [28, 34]$

E. There is no solution to the equation.

$$18 = \ln \sqrt{\frac{27}{e^x}}$$

$$18 = \ln \left( \left( \frac{27}{e^x} \right)^{\frac{1}{2}} \right)$$

$$18 = \frac{1}{2} \left[ \ln \left( \frac{27}{e^x} \right) \right]$$

$$18 = \frac{1}{2} \left[ \ln(27) - \ln(e^x) \right]$$

$$18 = \frac{\ln(27)}{2} - \frac{x}{2}$$

$$36 = \ln(27) - x$$

$$\frac{36 - \ln(27)}{-36 + \ln(27)} = -x$$

$$\boxed{-36 + \ln(27)} = x$$

40. Solve the equation for  $x$  and choose the interval that contains the solution (if it exists).

- A.  $x \in [1.4, 4.5]$
- B.  $x \in [-2.6, -0.3]$
- C.  $x \in [-4.7, -2.5]$
- D.  $x \in [4.8, 6]$

E. There is no Real solution to the equation.

$$2^{-5x-3} = 343^{-3x+5}$$

$$\ln(2^{-5x-3}) = \ln(343^{-3x+5})$$

$$(-5x-3)\ln(2) = (-3x+5)\ln(343)$$

$$-5x\ln(2) - 3\ln(2) = -3x\ln(343) + 5\ln(343)$$

E. There is no Real solution to the equation.

$$x = -32.7$$

$$-5x\ln(2) - 3\ln(2) = -3x\ln(343) + 5\ln(343)$$

$$+5x\ln(2) \quad \quad \quad = +5x\ln(2)$$

$$\begin{aligned} -3\ln(2) &= -3x\ln(343) + 5x\ln(2) + 5\ln(343) \\ -5\ln(343) &= \end{aligned}$$

$$-3\ln(2) - 5\ln(343) = -3x\ln(343) + 5\ln(2)$$

$$-3\ln(2) - 5\ln(343) = x(-3\ln(343) + 5\ln(2))$$

$$\boxed{\frac{-3\ln(2) - 5\ln(343)}{-3\ln(343) + 5\ln(2)} = x} \Rightarrow x = 2.23$$