LG 16 Ver A

Name: _____ Student #:_____

Date:_____ T.A. #:_____

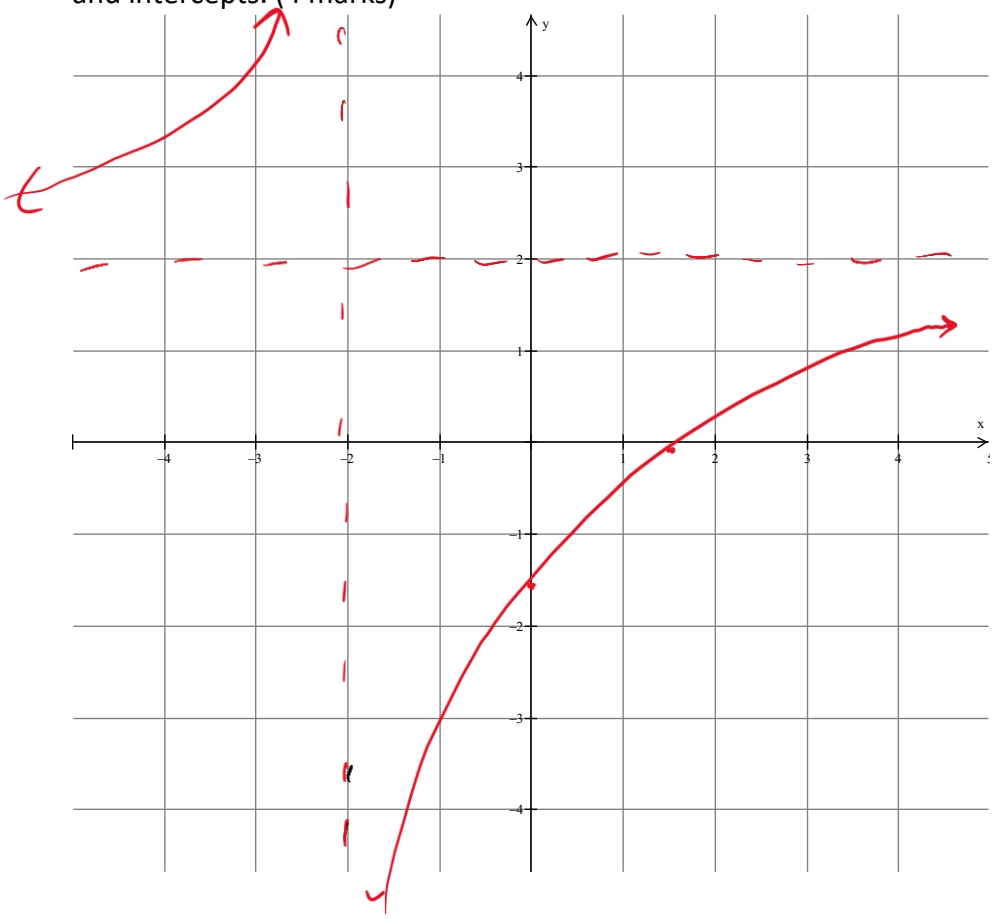
Mathematics 12 Pre-Calculus
LEARNING GUIDE 16 TEST – RATIONAL FUNCTIONS

/20

***Full marks will NOT be given for the final answer only.**

When using a calculator, you should provide a decimal answer that is correct **to at least two decimal places** (unless otherwise indicated). Such rounding should occur **only** in the final step of the solution.

1. Sketch the graph of $y = \frac{2x-3}{x+2}$ and determine the equations of any asymptotes and intercepts. (4 marks)



ASYMPTOTES

$x = -2$

$y = 2$

X INT: 1.5

y INT: -1.5

/4

2. Create a rational function with asymptotes at x = 2 and y = -3. (2 marks)

$y = \frac{-3x+c}{x-2}$ ← ANY CONSTANT HERE IS OK.

OR $y = \frac{c}{x-2} - 3$

3. For the function $f(x) = \frac{x+3}{x^2-x-12}$:

a) Determine the values of x where an asymptote occurs. (1 mark)

$x^2 - x - 12 = 0$

$(x-4)(x+3) = 0$

$x = 4$ OR -3

BUT -3 MAKES THE NUMERATOR $= 0$ SO ONLY $x = 4$.

b) Determine the values of x where a point of discontinuity exists. (1 mark)

$x = -3$ IS WHERE THE NUMERATOR AND DENOMINATOR ARE BOTH 0.

c) Determine the x and y intercepts of the function (2 marks)

X INT: DOES NOT EXIST

Y INT: $-\frac{1}{4}$

/6

4. Solve the following equation algebraically. (3 marks)

$$\frac{2}{x} = 3 - \frac{7x}{x-2}$$

$x(x-2)$

$2(x-2) = 3x(x-2) - 7x(x)$

$2x - 4 = 3x^2 - 6x - 7x^2$

$2x - 4 = -4x^2 - 6x$

$4x^2 + 8x - 4 = 0$

$x^2 + 2x - 1 = 0$

$x = \frac{-2 \pm \sqrt{2^2 - 4(1)(-1)}}{2(1)}$

$x = \frac{-2 \pm \sqrt{8}}{2}$

$x = \frac{-2 \pm 2\sqrt{2}}{2}$

$x = -1 \pm \sqrt{2}$

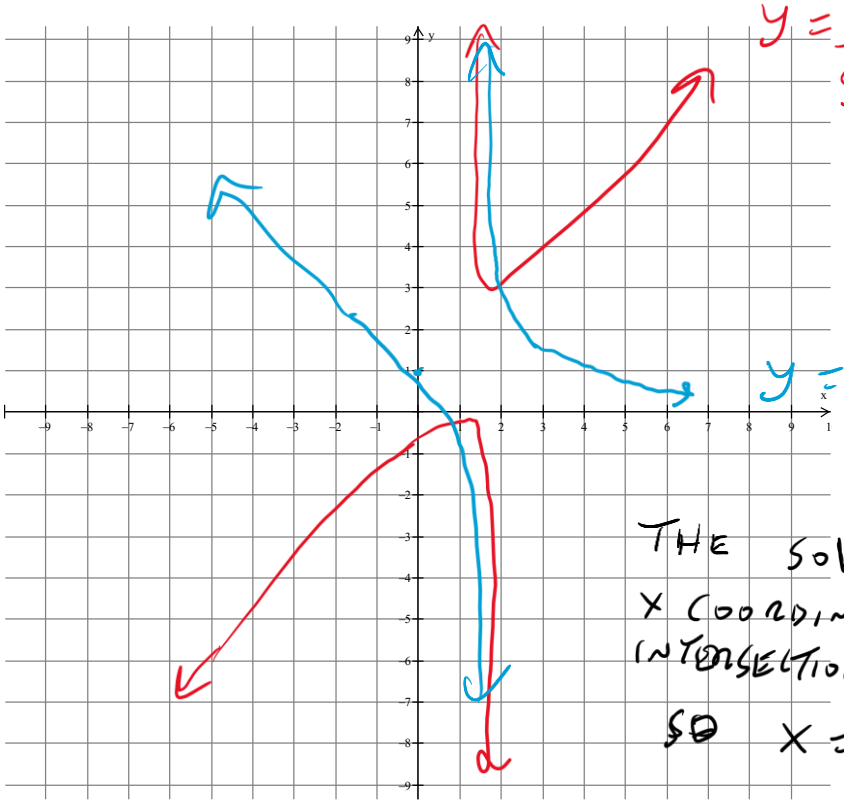
or $x \approx -2.41, 0.41$

5. Solve the following equation graphically. (3 marks)

$$\frac{3}{5x-7} + x = 1 + \frac{x^2 - 4x}{7 - 5x}$$

$y = \frac{3}{5x-7} + x$

$y = 1 + \frac{x^2 - 4x}{7 - 5x}$



THE SOLUTION IS THE X COORDINATE OF THE INTERSECTION POINTS.

SO $x = 1, 1.67$

/6

6. An airplane makes a 990-mi flight with a tail wind and returns, flying into the wind. The total flying time is 3 h 20 min, and the plane's airspeed is 600 mph. What is the wind speed in mph? (4 marks)

LET w = SPEED OF THE WIND.

$\text{TIME} = \frac{\text{DISTANCE}}{\text{SPEED}}$ TOTAL TIME = $3\frac{1}{3}$ hr OR $\frac{10}{3}$ hr

TIME THERE = $\frac{990}{600+w}$ TIME BACK = $\frac{990}{600-w}$

$$\left(\frac{990}{600+w} + \frac{990}{600-w} = \frac{10}{3}\right)(600+w)(600-w)(3)$$

$$990(600-w)(3) + 990(600+w)(3) = 10(600+w)(600-w)$$

$$1782000 - 2970w + 1782000 + 2970w = 3600000 - 6000w + 6000w - 10w^2$$

$$3564000 = 3600000 - 10w^2$$

$$10w^2 = 36000$$

$$\sqrt{w^2} = \sqrt{3600}$$

$$w = 60$$

THE WINDSPEED IS 60 mph.

/4