

Solve each of the inequalities

#1 Solve the inequality, be sure answer is in **interval notation**.

$$\frac{2x^2 + 7x - 15}{3x^2 + 5x - 2} \leq 0 \quad \frac{(2x-3)(x+5)}{(3x-1)(x+2)} \leq 0$$

(+) 0 (-) DNE (+) DNE (-) 0 (+)
 \leftarrow $\frac{-5}{-5}$ $\frac{-2}{-2}$ $\frac{1/3}{1/3}$ $\frac{1/2}{1/2}$ \rightarrow

#1 $[-5, -2) \cup (1/3, 1/2]$

#2 Solve the inequality, be sure answer is in **interval notation**.

$$\frac{(g-3)(2g-5)}{(g-7)(g+2)} \leq 0$$

#2 $(-2, 2.5] \cup [3, 7)$

(+) DNE (-) 0 (+) 0 (-) DNE (+)
 \leftarrow $\frac{-2}{-2}$ $\frac{2.5}{2.5}$ $\frac{3}{3}$ $\frac{7}{7}$ \rightarrow

Functions for problem #3

$f(x) = 2x - 7$,

$g(x) = x^2 - 4x - 5$,

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

a. find $f(9) + g(2) + h(0)$

$$[2(9)-7] + [2^2 - 4(2) - 5] + [0^2 + 4]$$

11 + (-9) + 4

#3a 6

b. find $f(f(3))$

$$f(3) = 2(3) - 7 = -1$$

$$f(-1) = 2(-1) - 7 = -9$$

#3b -9

c. find $(g(h(f(2))))$

$$f(2) = 2(2) - 7 = -3 \quad h(-3) = (-3)^2 + 4 = 13$$

#3c 110

$$g(13) = 13^2 - 4(13) - 5 = 110$$

d. Find the **solution set** for $f(g(x)) = g(f(x))$

#3d $X = \{4.8787, 9.1213\}$

(Four decimal places)

$$2[x^2 - 4x - 5] - 7 = [2x - 7]^2 - 4[2x - 7] - 5$$

$$2x^2 - 8x - 10 - 7 = 4x^2 - 28x + 49 - 8x + 28 - 5$$

$$2x^2 - 8x - 17 = 4x^2 - 36x + 72$$

$$0 = 2x^2 - 28x + 89$$

$$X = \{4.8787, 9.1213\} \text{ From QUADRATIC FORMULA}$$

#4 Identify the center and the radius.

$$x^2 + y^2 - 4x + 6y - 3 = 0$$

$$x^2 - 4x + y^2 + 6y = 3$$

$$x^2 - 4x + 4 + y^2 + 6y + 9 = 3 + 13$$

$$(x-2)^2 + (y+3)^2 = 16$$

#4 CENTER (2, -3) RADIUS: 4

#8 Solve the following systems of equations

a. $x + 3y - z = 13$
 $x + 2y + 3z = 4$
 $2x - 3y + 4z = 5$

b. $6x + 2y = 34$
 $3x - 4y = 7$

c. $3x - y + 2z = 16$
 $x + 7y - 4z = -19$
 $5x - 2y + 2z = 27$

a. (8, 1, -2)

b. (5, 2)

c. (4, -3, 1/2)

#9 Write the equation of each circle

(1, -5)
 (2, -6)
 (8, 2)

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

$$x^2 + y^2 + Ax + By + C = 0$$

(1, -5): $1 + 25 + A - 5B + C = 0$

$$A - 5B + C = -26$$

(2, -6): $4 + 36 + 2A - 6B + C = 0$

$$2A - 6B + C = -40$$

(8, 2): $64 + 4 + 8A + 2B + C = 0$

$$8A + 2B + C = -68$$

So RREF $\Rightarrow A = -10 \quad B = 4 \quad C = 4$

$$x^2 - 10x + y^2 + 4y = -4$$

$$x^2 - 10x + 25 + y^2 + 4y + 4 = -4 + 29$$

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

#10 Solve (Answer as mixed numbers no decimals please)

a) $10|3x+5|^2 - 11|3x+5| = -3$

Let $M = |3x+5|$

$$10M^2 - 11M + 3 = 0$$

$$(5M-3)(2M-1) = 0$$

$$M = 3/5 \quad M = 1/2$$

$$|3x+5| = 3/5$$

$$3x+5 = 3/5 \quad 3x+5 = -3/5$$

$$3x = 3/5 - 5 \quad 3x = -3/5 - 5$$

$$x = -17/15 \quad x = -113/15$$

$$|3x+5| = 1/2$$

$$3x+5 = 1/2 \quad 3x+5 = -1/2$$

$$3x = 1/2 - 5 \quad 3x = -1/2 - 5$$

$$x = -1/2 \quad x = -11/6$$

#12a $x = \{-113/15, -11/6, -1/2, -17/15\}$

#11 Write each of the following in standard H, K forms identify characteristics of each

a. $25x^2 + 4y^2 - 150x + 8y + 129 = 0$

$$25[x^2 - 6x] + 4[y^2 + 2y] = -129$$

$$25[x^2 - 6x + 9] + 4[y^2 + 2y + 1] = -129 + 25(9) + 4(1)$$

$$25(x-3)^2 + 4(y+1)^2 = 100$$

$$\frac{(x-3)^2}{4} + \frac{(y+1)^2}{25} = 1$$

#11a.

Characteristics: VERTICAL ELLIPSE
 CENTER (3, -1)
 MA LENGTH: 10
 MA LENGTH: 4
 FOCI (3, -1 ± √21)

b. $x^2 + 8x - 2y + 2 = 0$

$$x^2 + 8x + 16 + 2(-16) = 2y$$

$$(x+4)^2 - 14 = 2y$$

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

#11b. $y = \frac{1}{2}(x+4)^2 - 7$

Characteristics: OBTUSE PARABOLA
 OPENS UP
 VERTEX (-4, -7)

#12. Find the area of the triangle with vertices at (3, 1), (-5, -2), and (11, -3)

$$\frac{1}{2} \begin{vmatrix} 3 & 1 & 1 \\ -5 & -2 & 1 \\ 11 & -3 & 1 \end{vmatrix} = \frac{1}{2} |56| = 28$$

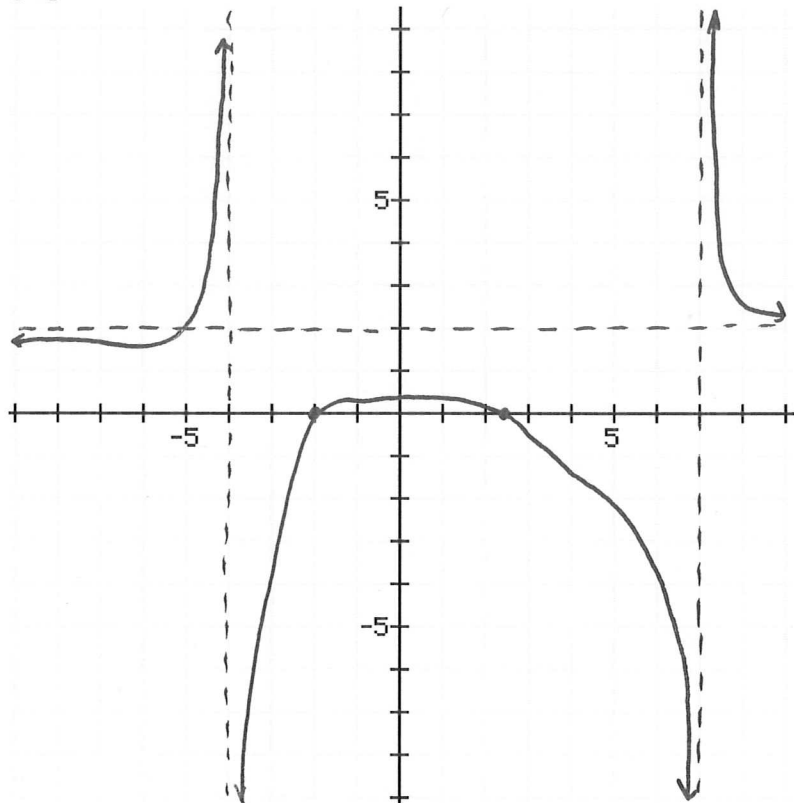
#12 28 UNITS SQUARED

Graph and identify zeroes, all asymptotes, and perform a sign check.

13a. $y = \frac{2x^2 - x - 10}{x^2 - 3x - 28}$

$$\frac{(2x-5)(x+2)}{(x-7)(x+4)}$$

graph



zeroes $x = \{-2, 2\frac{1}{2}\}$

vertical asymptotes $x \neq \{-4, 7\}$

horizontal asymptotes $y = 2$

sign check $\leftarrow \begin{array}{c} (+) \text{ DNE} \quad (-) \quad 0 \quad (+) \quad 0 \quad (-) \quad \text{DNE} \quad (+) \\ \hline -4 \quad -2 \quad 2\frac{1}{2} \quad 7 \end{array} \rightarrow$
 $\lim_{x \rightarrow -\infty} f(x) = 2^-$ $\lim_{x \rightarrow \infty} f(x) = 2^+$

13b State the domain and range using **interval notation**.

13b Domain: $(-\infty, -4) \cup (-4, 7) \cup (7, \infty)$ 13b Range: $(-\infty, .3572] \cup [1.875, \infty)$

Calculus (Take Home) Test 1

Name KEY

1) Write the equation of each circle

- a. $(-4, 3)$ b. $(10, 3)$
 $(2, 3)$ $(6, -5)$
 $(5, 0)$ $(-2, -1)$

a $(x+1)^2 + (y+3)^2 = 45$

b $(x-4)^2 + (y-1)^2 = 40$

2) Find the equation of x and y such that the distance between (x, y) and $(6, -5)$ is $\sqrt{2}$ times the distance between (x, y) and $(2, -1)$.

2 $(x+2)^2 + (y-3)^2 = 64$

3) Explain two different ways to determine if $A(-1, 3)$, $B(2, 9)$, and $C(3, 1)$ are collinear.

SEE OTHER PAPER

4) Find the vertices of a triangle if it has midpoints at $(-1, 7)$, $(5, 8)$, $(8, 3)$.

4 $(-4, 12), (2, 2), (14, 4)$

5) Solve $2|x+3|^2 - 13|x+3| = -15$

5 $x = \{-8, -4\frac{1}{2}, -1\frac{1}{2}, 2\}$

6) Solve the following systems of equations

$$12x - y + 12z = 6$$

a. $2x + y - 2z = -4$

$$9x + 2y + 3z = 3$$

b. $5x + 9y = 19$

$$2x - y = -20$$

$$2x - y + z = 4$$

c. $x + y - z = 11$

$$4x - 2y + 2z = 5$$

a. $(-2, 6, 3)$

b. $(-7, 6)$

c. NO SOLUTION

$$3x + 6y - 6z = 9$$

d. $2x - 5y + 4z = 6$

$$-x + 16y + 14z = -3$$

e. $3x - 5y = 1$

$$2x + y = -2$$

$$x + 3y - 2z = 4$$

f. $4x - y + z = -1$

$$3x - 4y + 3z = -5$$

d. $(3, 0, 0)$

e. $(-9/13, -8/13)$

f. NO SOLUTION

7) If $f(x) = x - 3$, $g(x) = x^2 - x - 6$, $h(x) = x^2 + 9$

a. find $f(5) + g(2) + h(0)$

a. 7

b. find $f(f(3))$

b. -3

c. find $(g(h(f(2))))$

c. 84

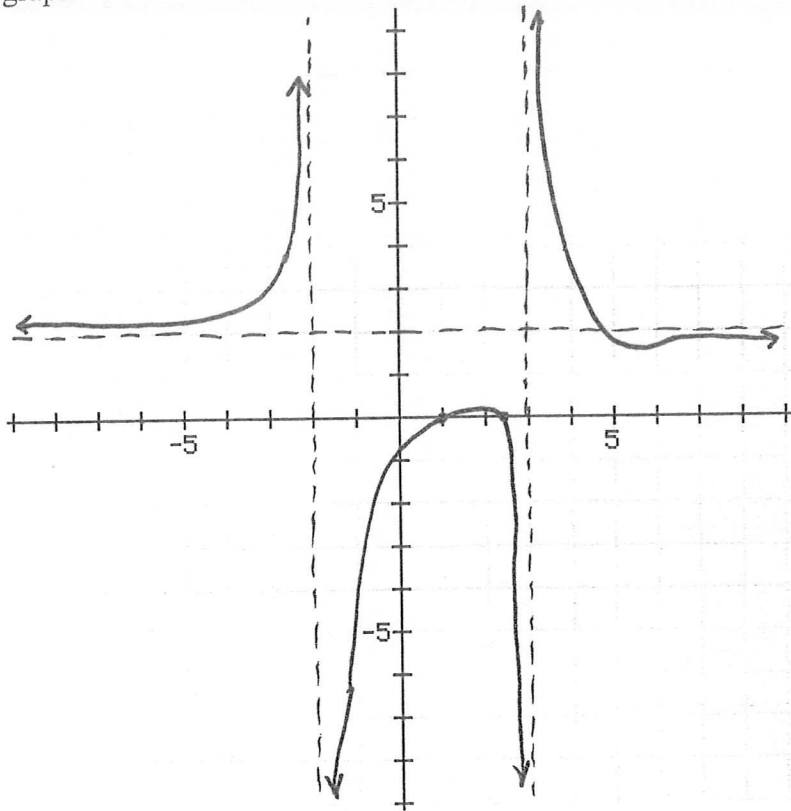
d. find the **solution set** for $f(g(x)) = g(f(x))$

d. $x = 2\frac{1}{2}$

Graph and identify zeroes, all asymptotes, and perform a sign check, remember to check extreme values.

$$9. y = \frac{2x^2 - 7x + 5}{x^2 - x - 6} = \frac{(2x-5)(x-1)}{(x-3)(x+2)}$$

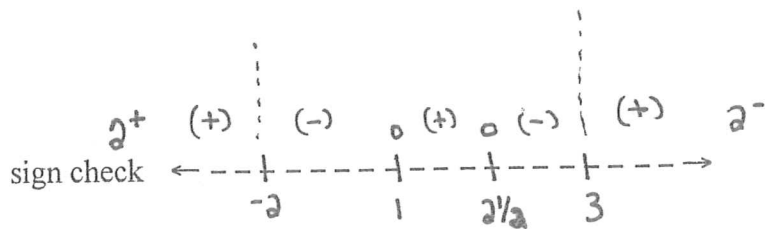
graph



zeroes $x = 1, 2.5$

vertical asymptotes $x = -2, 3$

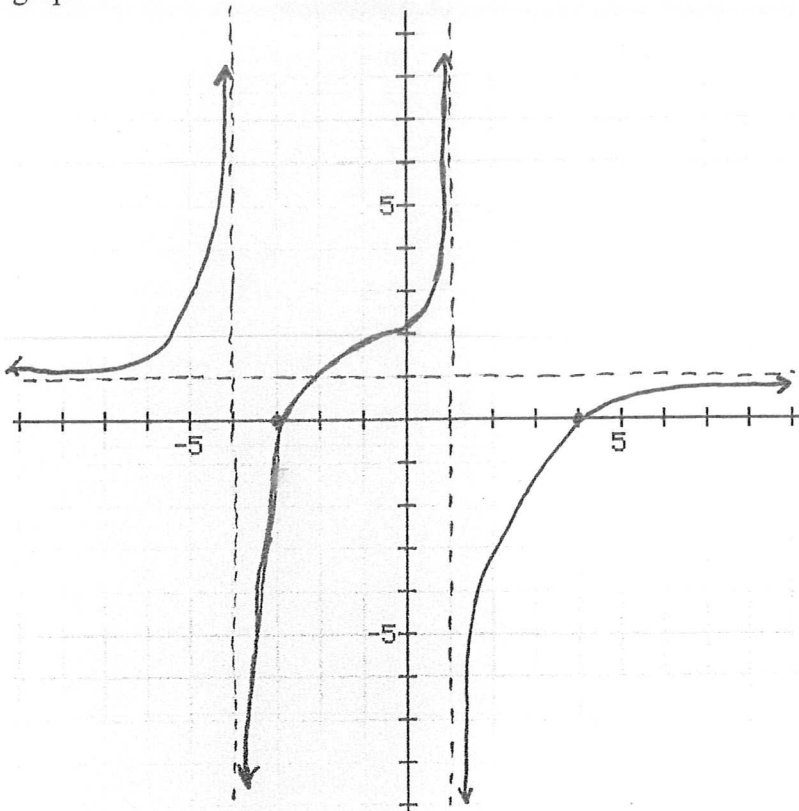
horizontal asymptotes $y = 2$



Graph and identify zeroes, all asymptotes, and perform a sign check.

$$10. \frac{x^2 - 9}{x^2 + 3x - 4} = \frac{(x-3)(x+3)}{(x+4)(x-1)}$$

graph



zeroes $x = -3, 3$

vertical asymptotes $x = -4, 1$

horizontal asymptotes $y = 1$

