

1 Solve $f(x) = \frac{x+1}{2x^2+5x-3}$ Find the domain and asymptotes

2 Find the Domain and solve
find asymptotes $f(x) = \frac{2x+1}{x-3}$

3 Find the Domain and solve
find asymptotes $f(x) = \frac{x^2+1}{x-2}$

4 Explain the change from $y = \sqrt{x}$ to $y = \sqrt{4x+12}$

5 Solve $\sqrt{11-x} - x = 1$

6 Solve

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

7 Solve

$$\sqrt[3]{x^2+3x} = \sqrt[3]{5}$$

8 Solve

$$\sqrt{2x+3} - \sqrt{x+1} = 1$$

9 Solve

$$15x^{-2} - 19x^{-1} + 6 = 0$$

10 Solve

$$2x^{\frac{2}{3}} + 5x^{\frac{1}{3}} - 3 = 0$$

11 Solve

$$\frac{\frac{2}{3}(x+1)x^{-\frac{1}{3}} - x^{\frac{2}{3}}}{(x+1)^2} = 0$$

12 Find domain and asymptotes

Solve

$$\frac{1}{x-1} + \frac{1}{x+1} > \frac{3}{4}$$

13 Find domain and asymptotes

Solve

$$f(x) = \sqrt[4]{4x+12}$$

14 Find domain and asymptotes

Solve

$$f(x) = \sqrt[3]{-8x+8}$$

15 Graph

$$f(x) = \frac{x+1}{2x^2+5x-3}$$

16 Graph

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

17 Graph

$$f(x) = \frac{3x^2 - 3x - 6}{x^2 + 8x + 16}$$

18 Graph

$$f(x) = \frac{\cancel{3x^2 - 3x - 6}}{\cancel{x^2 + 8x + 16}}$$

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

19 Graph

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

20 Solve

$$\frac{x+2}{2x+1} = 1$$

21 Solve

$$\frac{x}{x-2} + \frac{1}{x+2} = \frac{8}{x^2-4}$$

22 Solve

$$\frac{x+2}{2x+1} \leq 1$$

23 Solve

$$f(x) = 7x^{-4} - 8x^{-2} + 1$$

24 Solve



25 Graph

$$f(x) = 7x^{-4} - 8x^{-2} + 1$$

$$26 \quad f(x) \leq 0$$

$$f(x) = 7x^{-4} - 8x^{-2} + 1$$

$$27 \quad f(x) \geq 0$$

$$f(x) = 7x^{-4} - 8x^{-2} + 1$$

1. $f(x) = \frac{x+1}{2x^2+5x-3}$

Asymptotes

VA: $2x^2+5x-3=0$
 $(2x-1)(x+3)=0$

$2x-1=0$ $x+3=0$

$x = \frac{1}{2}$ $x = -3$

HA: TD BD
 $1 < 2$

$y=0$

Oblique None

Solution: $x+1=0$
 $x=-1$

Domain
 $(-\infty, -3) \cup (-3, \frac{1}{2}) \cup (\frac{1}{2}, \infty)$

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

Asymptotes

VA: $x-3=0$
 $x=3$

HA: TD BD
 $1 = 1$

Oblique: NONE

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

Domain
 $(-\infty, 3) \cup (3, \infty)$

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

Asymptote

VA: $x-2=0$
 $x=2$

HA: TD BD
 $2 > 1$

Oblique: $\begin{array}{r|rrr} 2 & 1 & 0 & 1 \\ & \downarrow & 2 & 4 \\ & & 1 & 2 & 5 \end{array}$

Since top is greater by exactly 1

None

$y=x+2$

Domain: $(-\infty, 2) \cup (2, \infty)$

4. $y = \sqrt{x}$ to $y = \sqrt{4x+12}$

1. moved left + 3 ←

2. stretched vertically by a factor of 2

$$y = \sqrt{4x+12}$$

$$y = \sqrt{4(x+3)}$$

$$y = \sqrt{4} \cdot \sqrt{x+3}$$

→ 2

5. $\sqrt{11-x} - x = 1$

$$\sqrt{11-x} = x + 1$$

$$(\sqrt{11-x})^2 = (x+1)^2 \rightarrow \text{foil}$$

$$11-x = x^2 + 2x + 1$$

$$0 = x^2 + 3x - 10$$

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

$$= x = -5 \quad x = 2$$

$$\checkmark \sqrt{11+5} - (-5) = 1$$

$$4 + 5 = 1$$

False

$$\checkmark \sqrt{11-2} - 2 = 1$$

$$\sqrt{9} - 2 = 1$$

$$3 - 2 = 1$$

$$1 = 1$$

True

$$\boxed{x = 2}$$

Put in calc: $\sqrt{11-x} - x - 1 = 0$

$$\rightarrow \{2\}$$

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

$$(\sqrt{5-5x})^2 = (1-x)^2$$

$$5-5x = 1-2x+x^2$$

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

$$= (x+4)(x-1)$$

$$x = -4 \quad x = 1$$

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

$$(25)^{\frac{1}{2}} - 4 = 1$$

$$5 - 4 = 1$$

$$1 = 1$$

True

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

$$(0)^{\frac{1}{2}} + 1 = 1$$

$$1 = 1$$

True

$$\boxed{\{-4, 1\}}$$

check in calc:
 $(5-5x)^{\frac{1}{2}} + x - 1 = 0$

7.

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

$$x^2+3x = 5$$

$$x^2+3x-5 = 0$$

$$x = \frac{-3 \pm \sqrt{9-4(1)(-5)}}{2}$$

$$x = \frac{-3 \pm \sqrt{29}}{2}$$

$$x = \frac{-3 \pm \sqrt{29}}{2}$$

$$\left\{ \frac{-3-\sqrt{29}}{2}, \frac{-3+\sqrt{29}}{2} \right\}$$

check w/
calculator

8.
$$\sqrt{2x+3} - \sqrt{x+1} = 1$$

$$\left(\sqrt{2x+3}\right)^2 = \left(1 + \sqrt{x+1}\right)^2 \Rightarrow (1 + \sqrt{x+1})(1 + \sqrt{x+1})$$

$$2x+3 = 1 + 2\sqrt{x+1} + (x+1) \quad x=3$$

$$2x+3 = 2+x + 2\sqrt{x+1}$$

$$\frac{x+1}{2} = \frac{2\sqrt{x+1}}{2}$$

$$\frac{x+1}{2} = \sqrt{x+1}$$

$$\left(\frac{x+1}{2}\right)^2 = \left(\sqrt{x+1}\right)^2$$

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

$$4 \left(\frac{x^2+2x+1}{4} = x+1 \right)$$

$$x^2+2x+1 = 4x+4$$

$$x^2-2x-3 = 0$$

$$(x-3)(x+1) = 0$$

$$x=3 \quad x=-1$$

$$\sqrt{6+3} - \sqrt{3+1} = 1$$

$$\sqrt{9} - \sqrt{4} = 1$$

$$3-2 = 1$$

True

$$x=-1$$

$$\sqrt{-2+3} - \sqrt{-1+1} = 1$$

$$\sqrt{1} - \sqrt{0} = 1$$

$$1-0 = 1$$

$$1=1$$

True

$$\{-1, 3\}$$

Checked on
calculator

$$9. \quad 15x^{-2} - 19x^{-1} + 6 = 0$$

$$x^2 \left(\frac{15}{x^2} - \frac{19}{x} + 6 = 0 \right)$$

$$15 - 19x + 6x^2 = 0$$

$$6x^2 - 19x + 15 = 0 \quad \begin{array}{l} 6 \times 15 = 90 \\ -90 - 1 = -91 \end{array}$$

$$\star \quad 6x^2 - 10x - 9x + 15 = 0 \quad \begin{array}{l} -45 - 2 = -47 \\ -30 - 3 = -33 \end{array}$$

$$(6x^2 - 10x) + (-9x + 15) = 0 \quad \begin{array}{l} -18 - 5 = -23 \\ -15 - 6 = -21 \end{array}$$

$$2x(3x - 5) - 3(3x - 5) = 0 \quad -18 - 9 = -19$$

$$(3x - 5)(2x - 3) = 0$$

$$x = \frac{5}{3} \quad x = \frac{3}{2}$$

$$\left\{ \frac{3}{2}, \frac{5}{3} \right\}$$

Checked w/ calculator

$$10. \quad 2x^{\frac{2}{3}} + 5x^{\frac{1}{3}} - 3 = 0$$

$$\checkmark \quad 2(-27)^{\frac{2}{3}} + 5(-27)^{\frac{1}{3}} - 3 = 0$$

$$\star \quad 2(x^{\frac{1}{3}})^2 + 5x^{\frac{1}{3}} - 3 = 0 \quad \text{Let } m = x^{\frac{1}{3}}$$

True

$$2m^2 + 5m - 3 = 0 \quad \begin{array}{l} 2 \cdot -3 = -6 \\ 6 \cdot -1 = 5 \end{array}$$

$$2m^2 + 6m + (-1)m - 3 = 0$$

$$\checkmark \quad 2\left(\frac{1}{8}\right)^{\frac{2}{3}} + 5\left(\frac{1}{8}\right)^{\frac{1}{3}} - 3 = 0$$

$$(2m^2 + 6m) + (-1m - 3) = 0$$

True

$$2m(m+3) - 1(m+3) = 0$$

$$(m+3)(2m-1) = 0$$

$$m = -3 \quad m = \frac{1}{2}$$

$$x^{\frac{1}{3}} = -3 \quad x^{\frac{1}{3}} = \frac{1}{2}$$

$$\left(\sqrt[3]{x}\right)^3 = (-3)^3 \quad \left(\sqrt[3]{x}\right)^3 = \left(\frac{1}{2}\right)^3$$

$$x = -27 \quad x = \frac{1}{8}$$

✓

✓

$$\left\{ -27, \frac{1}{8} \right\}$$

$$11. \left(\frac{\frac{2}{3}(x+1)x^{-\frac{1}{3}} - x^{\frac{2}{3}}}{(x+1)^2} = 0 \right) (x+1)^2$$

★

$$\frac{2}{3}(x+1)x^{-\frac{1}{3}} - x^{\frac{2}{3}} = 0$$

$$\frac{2(x+1)}{3x^{\frac{1}{3}}} - \frac{x^{\frac{2}{3}}}{1} = 0$$

$$\frac{2(x+1)}{3x^{\frac{1}{3}}} - \left(\frac{3x^{\frac{1}{3}}}{3x^{\frac{1}{3}}} \right) \frac{x^{\frac{2}{3}}}{1} = 0$$

$$\left(\frac{2(x+1) - 3x}{3x^{\frac{1}{3}}} = 0 \right) 3x^{\frac{1}{3}}$$

$$2(x+1) - 3x = 0$$

$$2x + 2 - 3x = 0$$

$$-x + 2 = 0$$

$$-x = -2$$

$$x = 2$$

{ 2 } ★ Check on calculator

$$12. \frac{1}{x-1} + \frac{1}{x+1} > \frac{3}{4}$$

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

$$4(x+1) + 4(x-1) = 3(x-1)(x+1)$$

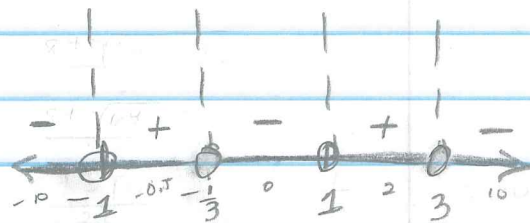
$$4x + 4 + 4x - 4 = 3x^2 - 3$$

$$8x = 3x^2 - 3$$

$$3x^2 - 8x - 3 = 0 \quad 3 \cdot -3 = -9$$

$$(3x^2 + 1)(x - 3) = 0 \quad -9 \cdot 10$$

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



where is $\frac{1}{x-1} + \frac{1}{x+1} - \frac{3}{4} > 0$

$$\boxed{\left(-1, -\frac{1}{3}\right) \cup (1, 3)}$$

13. $f(x) = \sqrt[4]{4x+12}$
 $(0) = (\sqrt[4]{4x+12})^4$

$0 = 4x+12$
 $-12 = 4x$
 $-3 = x$

$\{-3\}$

14. $f(x) = \sqrt[3]{-8x+8}$
 $(0) = (\sqrt[3]{-8x+8})^3$

$0 = -8x+8$
 $-8 = -8x$

$1 = x$ $\{1\}$

15. $0 = \frac{x+1}{2x^2+5x-3}$
 $0 = \frac{x+1}{(2x-1)(x+3)}$

VA

$x = \frac{1}{2}$ $x = -3$

HA

$y = 0$

oblique

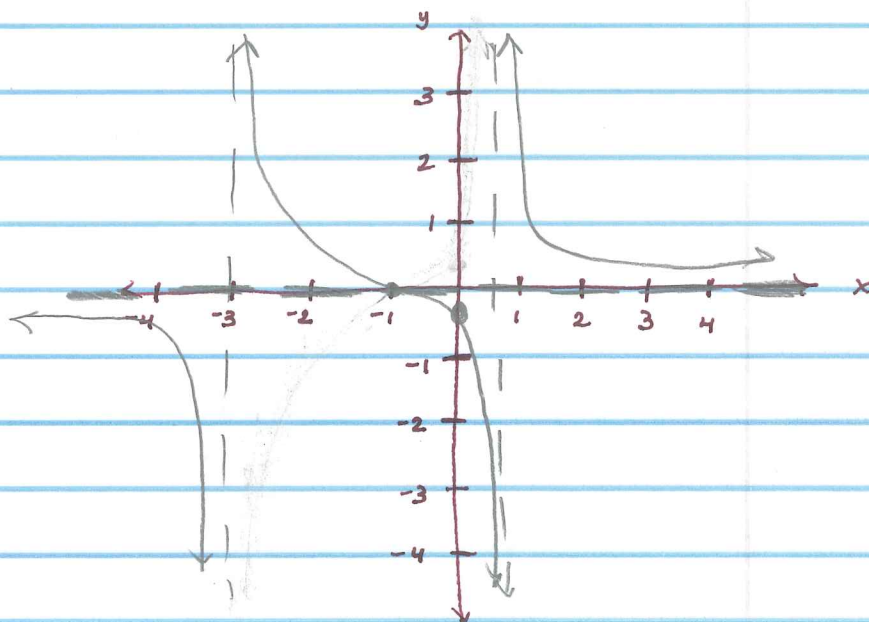
None

SOLN

$x = -1$ $\frac{-1+1}{2(-1)^2+5(-1)-3} = 0$

y-int $(-1, 0)$

$(0, -\frac{1}{3})$



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

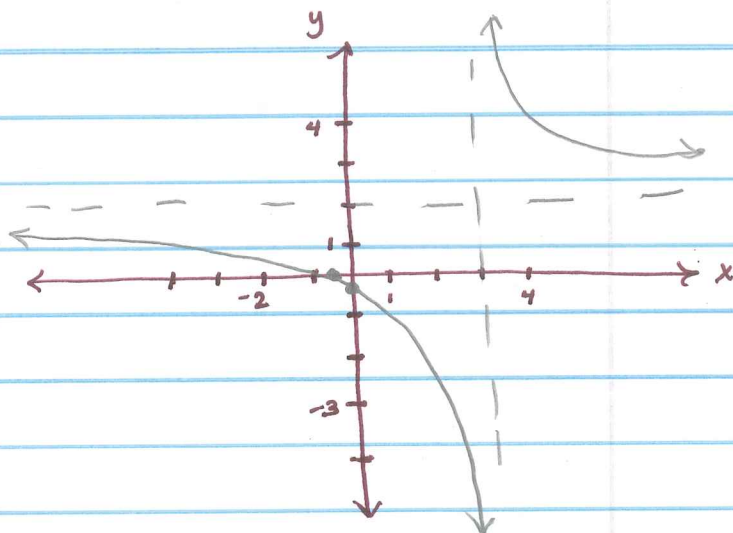
VA: $x=3$

HA: $y=2$

OBI: None

SOLN: $x = -\frac{1}{2}$

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



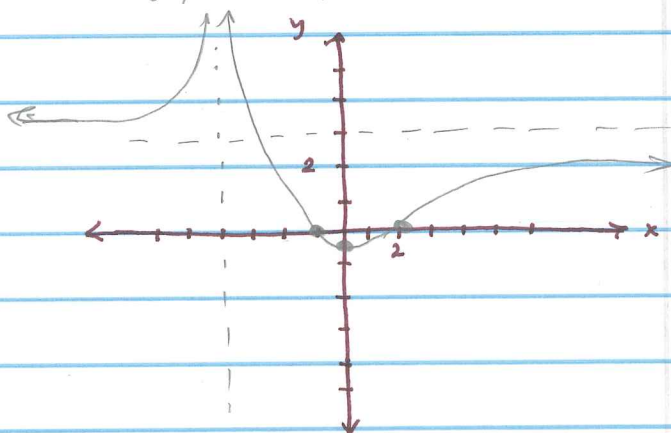
17. $f(x) = \frac{3x^2-3x-6}{x^2+8x+16}$

VA: $x=-4$ HA: $y=3$ OBI: None

$= \frac{3(x^2-x-2)}{x^2+8x+16}$

SOLN $x=2$ $x=-1$ y-int $(0, \frac{-3}{8})$
 $(2,0)$ $(-1,0)$

$f(x) = \frac{3(x-2)(x+1)}{(x+4)(x+4)}$



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

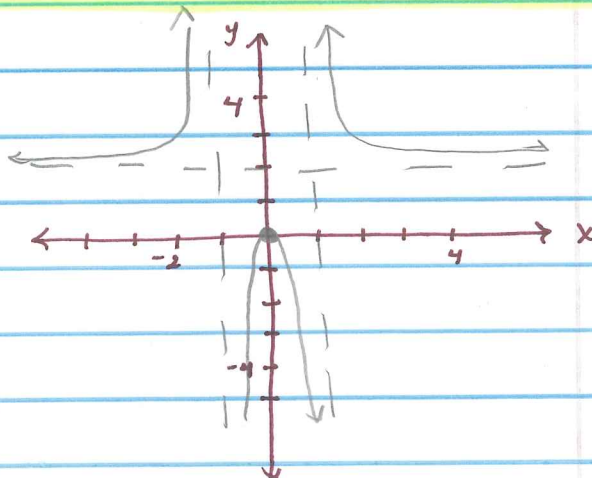
$f(x) = \frac{2x^2}{(x+1)(x-1)}$

VA: $x=-1$
 $x=1$

HA: $y=2$

SOLN: $x=0$ $(0,0)$

y-int: $y=0$
 $(0,0)$



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

VA $x=2$

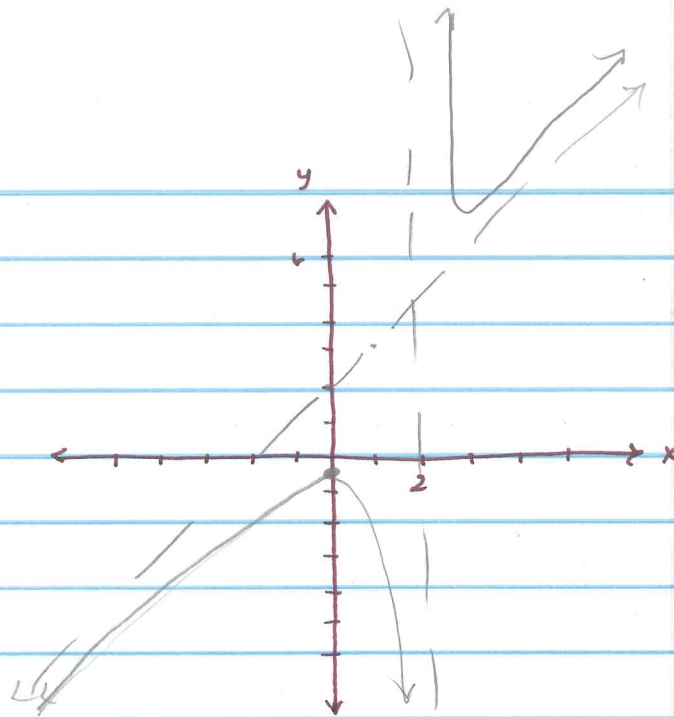
HA none

Obi $2 \mid 1 \ 0 \ 1$
 $\downarrow 2 \ 4$
 $1 \ 2 \ 5$

$y = x+2$

SolN $x^2+1=0$
 $x^2 = -1$
 $x = \pm i$

y-int: $(0, -\frac{1}{2})$



20. $\frac{x+2}{2x+1} = 1$ $\checkmark \frac{1+2}{2+1} = 1$
 $x+2 = 2x+1$ $\frac{1+2}{2+1} = 1$
 $1 = x$ $\frac{1+2}{2+1} = 1$
 $\{1\}$

21. $\left(\frac{x}{x-2} + \frac{1}{x+2} = \frac{8}{x^2-4} \right) (x-2)(x+2)$

$x(x+2) + 1(x-2) = 8$

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

$x^2 + 3x - 10 = 0$

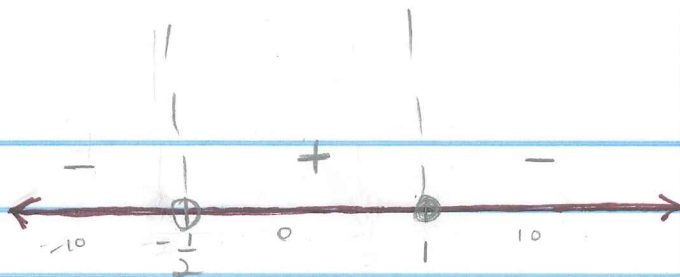
$(x+5)(x-2) = 0$

$x = -5 \quad x = 2$

\rightarrow not allowed

$\{-5\}$

$$22 \quad \frac{x+2}{2x+1} \leq 1$$



$$\frac{x+2}{2x+1} - 1 \leq 0$$

$$\frac{x+2}{2x+1} - \frac{2x+1}{2x+1} \leq 0$$

$$\frac{x+2-2x-1}{2x+1} \leq 0$$

$$\frac{-x+1}{2x+1} \leq 0$$

↙
↘

$$-x+1=0 \quad 2x+1=0$$

$$-x=-1$$

$$2x=-1$$

$$x=1$$

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

$$\left(-\infty, -\frac{1}{2}\right) \cup [1, \infty)$$

$$23. \quad f(x) = 7x^{-4} - 8x^{-2} + 1$$

$$\star \quad 0 = \frac{7}{x^4} - \frac{8}{x^2} + 1$$

$$0 = 7 - 8x^2 + x^4$$

$$0 = x^4 - 8x^2 + 7$$

$$0 = (x^2 - 7)(x^2 - 1)$$

$$x = \pm\sqrt{7} \quad x = \pm 1$$

$$\{-\sqrt{7}, -1, 1, \sqrt{7}\}$$

$$25. \quad f(x) = \frac{7-8x^2+x^4}{x^4}$$

$$f(x) = \frac{x^4 - 8x^2 + 7}{x^4}$$

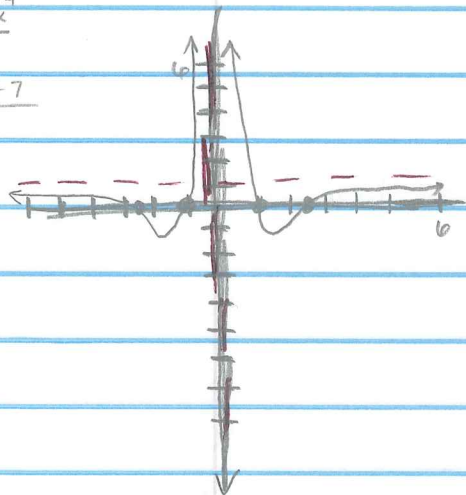
$$\text{VA } x=0$$

$$\text{HA } y=1$$

Obi none

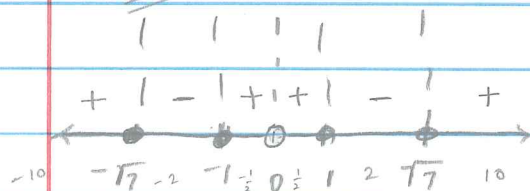
Soln

y-int none



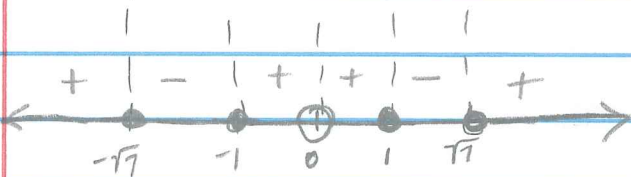
26. $7x^{-4} - 8x^{-2} + 1 \leq 0$

see 23



$[-7, -1] \cup [1, \sqrt{7}]$

27. $7x^{-4} - 8x^{-2} + 1 \geq 0$



$(-\infty, -7] \cup [-1, 0) \cup (0, 1] \cup [\sqrt{7}, \infty)$