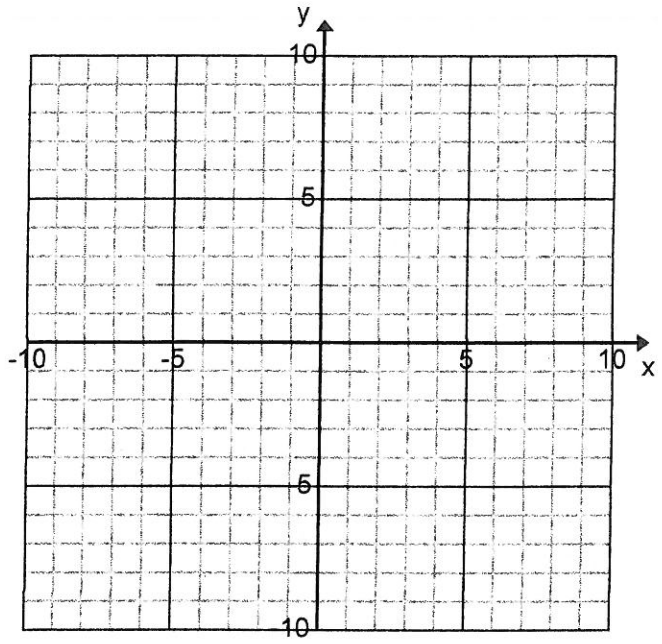
Name_____Sample of LAST QUIZ 2 before Break Period ____

YOU WILL NOT BE GIVEN A GRAPHING CALCULATOR for this quiz

$f(x) = \log_4(5x + 15)$



State the domain of this function as an inequality

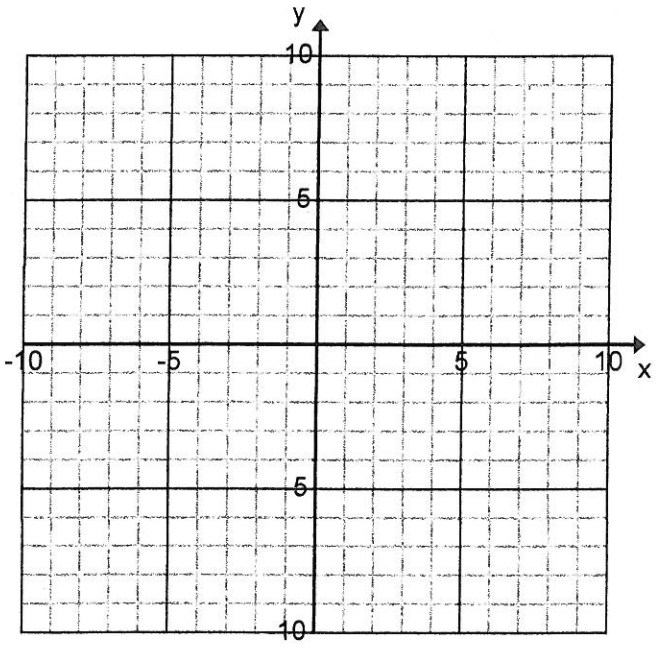
State the x intercept of this function

State the vertical asymptote of this function

State any two rational coordinates that lie on the graph of this function

Sketch a graph of this function on the provided axis

$f(x) = \log_6(12 - 4x)$



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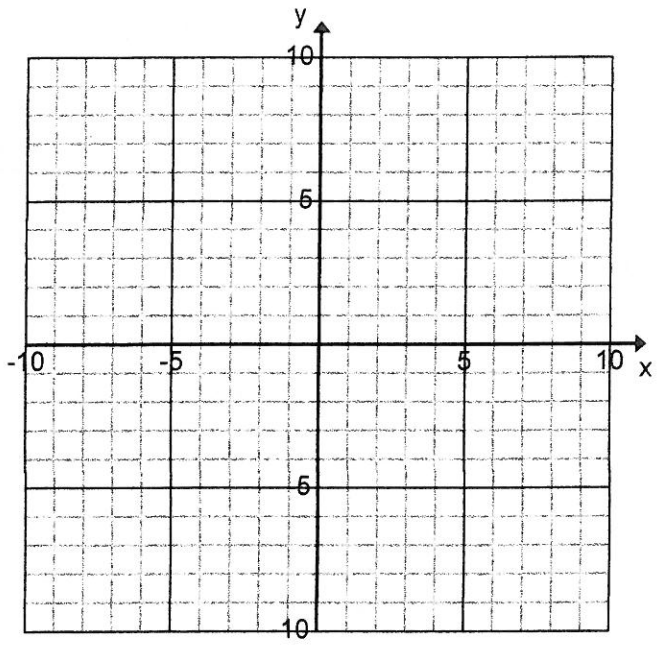
$$f(x) = \log_2(x^2 - 2x - 10)$$



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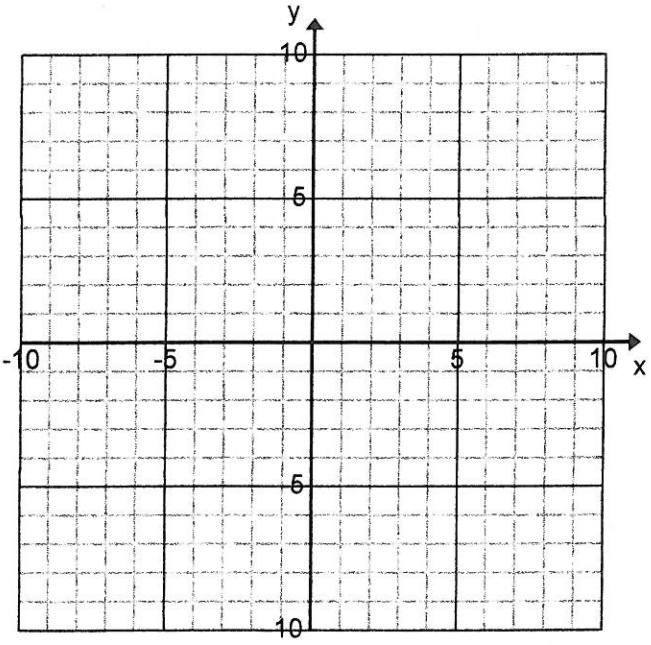
$$f(x) = \log_6(x^2 + 4x)$$



State the domain of this function as an inequality

State the x intercept of this function

State the vertical asymptote of this function

State any two rational coordinates that lie on the graph of this function

Sketch a graph of this function on the provided axis

① $f(x) = \log_4(5x+15)$

You need to solve these equations

$5x+15=0$
$-15 \quad -15$
$5x = -15$
$\frac{5x}{5} = \frac{-15}{5}$
$x = -3$ ← VA Domain Restriction

$5x+15=1$
$-15 \quad -15$
$5x = -14$
$\frac{5x}{5} = \frac{-14}{5}$
$x = -\frac{14}{5} = -2.8$ ← Power of base

$(-2.8, 0)$
$x \to -\infty$

$5x+15=4$ ← Power of base
$-15 \quad -15$
$5x = -11$
$\frac{5x}{5} = \frac{-11}{5}$
$x = -\frac{11}{5} = -2.2$

$(-2.2, 1)$

$5x+15=16$
$-15 \quad -15$
$5x = 1$
$\frac{5x}{5} = \frac{1}{5}$
$x = 0.2$

$(0.2, 2)$

$5x+15 = \frac{1}{4}$ ← Power of base

OR $(5x+15 = \frac{1}{4})4$

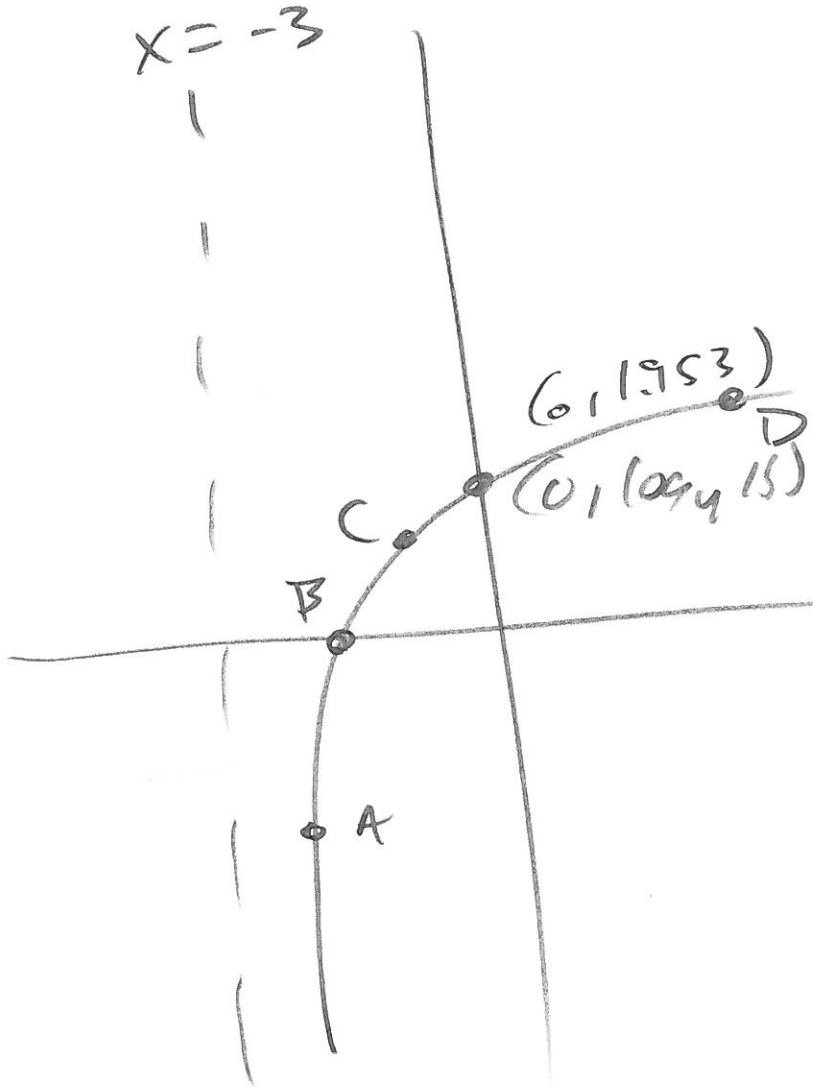
$-15 \quad -15$
$5x = -14\frac{3}{4}$
$5x = \frac{-59}{4}$
$x = \frac{-59}{4} \cdot \frac{1}{5} = \frac{-59}{20} = -2.95$

$(-2.95, -1)$

$20x+60 = 1$
$-60 \quad -60$
$20x = -59$
$x = -\frac{59}{20}$
$x \approx -2.95$

$(-2.95, -1)$

$$f(x) = \log_4(5x+15)$$



D: $x > -3$

x int

$(-2.8, 0)$

y int

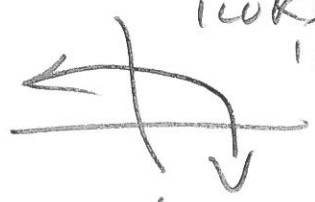
$0, \log_4 15$

$0, 1.953$

	X	y
A	$-\frac{59}{20}$	-1
B	$-\frac{14}{5}$	0
C	$-\frac{11}{5}$	1
D	$\frac{1}{5}$	2

	x	y
A	$-2\frac{19}{20}$	-1
B	$-2\frac{4}{5}$	0
C	$-2\frac{1}{5}$	1
D	$\frac{1}{5}$	2

A	y
-2.95	-1
-2.8	0
-2.2	1
0.2	2

$f(x) = \log_6(12 - 4x)$ → looks like 

base ↗

You need to solve these equations

$12 - 4x = 0$

$-12 \quad -12$

$-4x = -12$

$\frac{-4x}{-4} = \frac{-12}{-4}$

$x = 3$

D: $x < 3$

VA $x = 3$

$12 - 4x = 1$

$-12 \quad -12$

$-4x = -11$

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

$x = \frac{11}{4}$ (2.75, D)

$x = 2.75$ x int

$12 - 4x = 6$ ← power of base

$-12 \quad -12$

$-4x = -6$

$\frac{-4x}{-4} = \frac{-6}{-4}$ (1.5, 1)

$x = 1.5$

$12 - 4x = 36$ ← power of base

$-12 \quad -12$

$-4x = 24$

$\frac{-4x}{-4} = \frac{24}{-4}$

$x = -6$

(-6, 2)

$12 - 4x = \frac{1}{6}$ ← power of base

$-12 \quad -12$

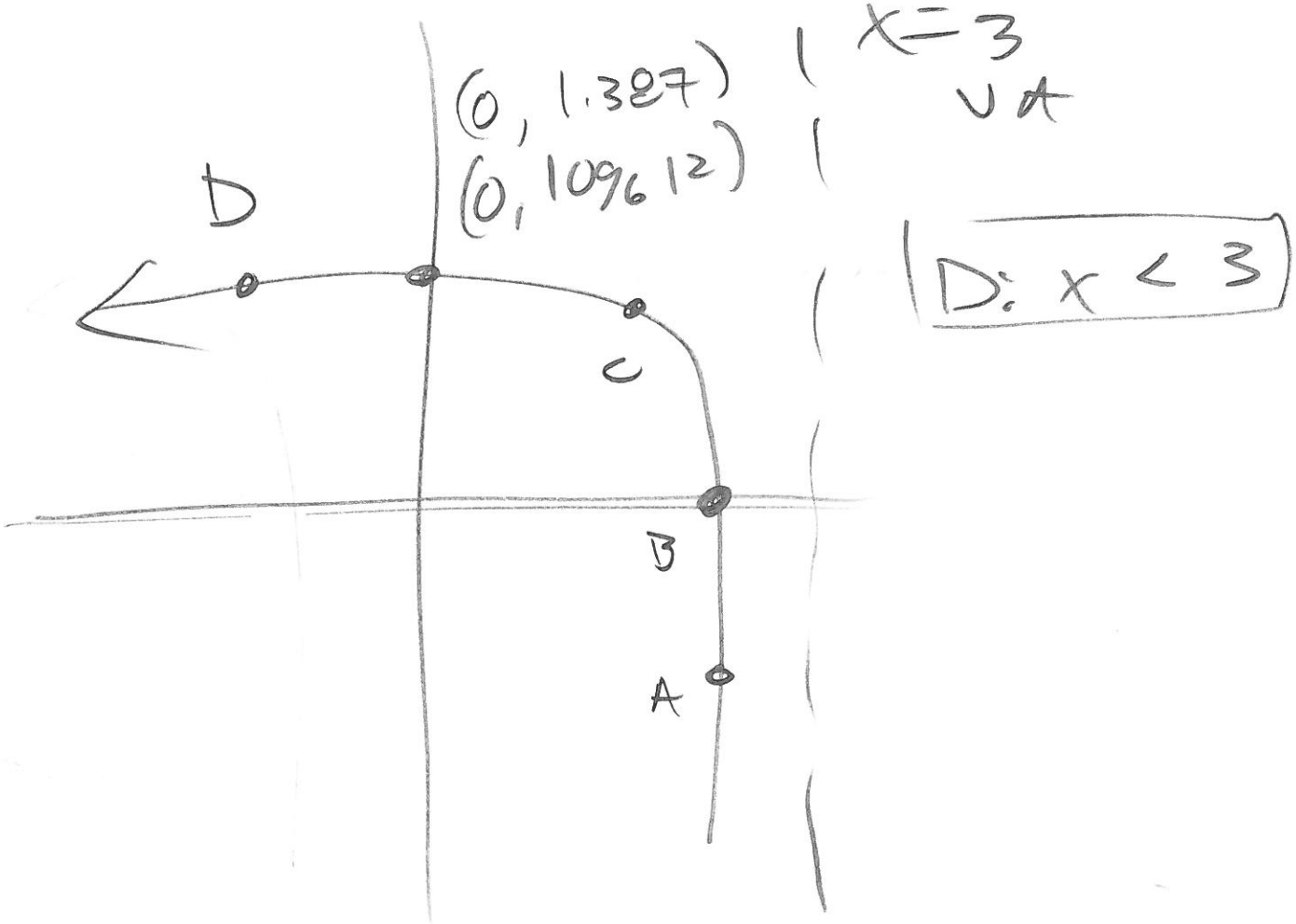
$-4x = -11\frac{5}{6}$

$-4x = -\frac{71}{6} \rightarrow \frac{-4x}{-4} = \frac{-71 \cdot 1}{6 \cdot 4}$

$x = \frac{71}{24} \approx 2.958\overline{3}$

$(2.958\overline{3}, -\frac{1}{6})$

$$f(x) = \log_6(12 - 4x)$$



	x	y
A	$\frac{71}{24}$	1
B	$\frac{11}{4}$	0
C	$\frac{6}{4}$	1
D	$-\frac{24}{4}$	2

	x	y
A	$2.958\overline{3}$	1
B	2.75	0
C	1.5	1
D	−6	2

* typo fixed

$$f(x) = \log_2(x^2 - 3x - 10)$$
$$= \log_2((x-5)(x+2))$$

Solve these equations

* you will need to use

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-b \pm \sqrt{D}}{2a}$$

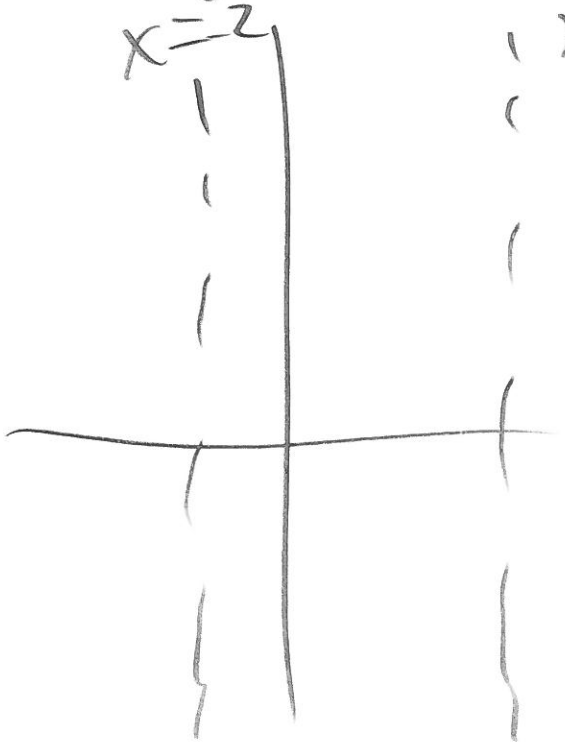
$x^2 - 3x - 10 = 0$

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

$x = 5$ $x = -2$

↳ Domain Restrictions

↳ VA



Note

$x = 0$ not allowed

why

$y = \log_2(0^2 - 3(0) - 10)$

$\log_2(-10)$

↑ not defined

So D: $x < -2$ or $x > 5$

Solve $x^2 - 3x - 10 = 1$

$x^2 - 3x - 11 = 0$

not factorable ↗

$D = b^2 - 4ac$ = Discriminant

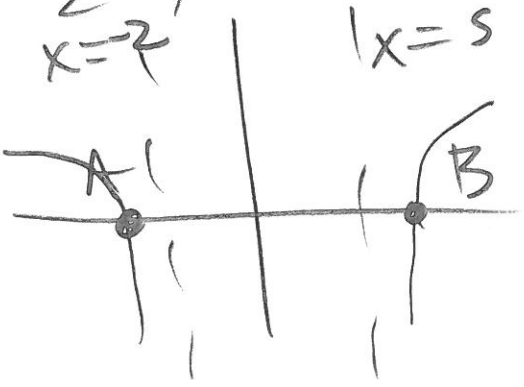
$D = (-3)^2 - 4(1)(-11)$ ← watch this

$= 53$

$x = \frac{3 \pm \sqrt{53}}{2}$ = x-intercepts

$\left(\frac{3-\sqrt{53}}{2}, 0\right) \approx -2.140$ A

$\left(\frac{3+\sqrt{53}}{2}, 0\right) \approx 5.140$ B



Solve $x^2 - 3x - 10 = 2$ ← power of base

$-2 \quad -2$

$x^2 - 3x - 12 = 0$

$D = (-3)^2 - 4(1)(-12)$

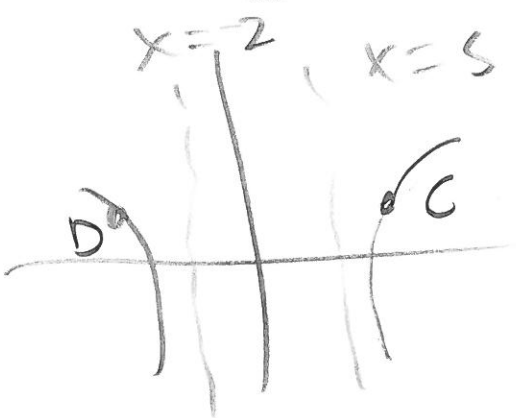
$D = 57$

$x = \frac{3 \pm \sqrt{57}}{2} \approx -2.275$

5.275

$\left(\frac{3+\sqrt{57}}{2}, 1\right) \approx (5.275, 1)$ C

$\left(\frac{3-\sqrt{57}}{2}, 1\right) \approx (-2.275, 1)$ D



Solve $x^2-3x-10=4$ square of base

$$x^2-3x-14=0$$

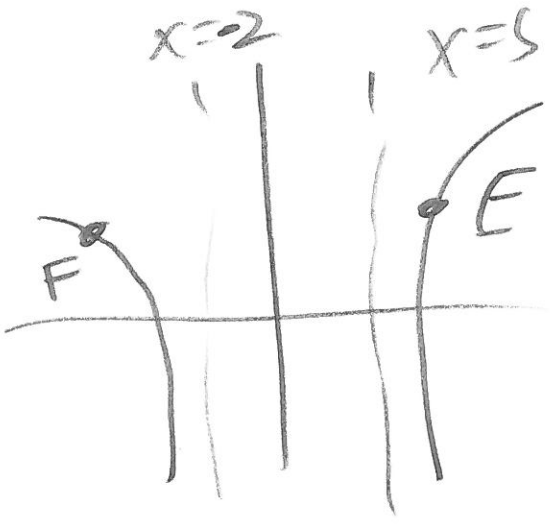
$$D=(-3)^2-4(1)(-14)$$

$$D=65$$

$$x=\frac{3\pm\sqrt{65}}{2}\approx -2.531 \text{ or } 5.531$$

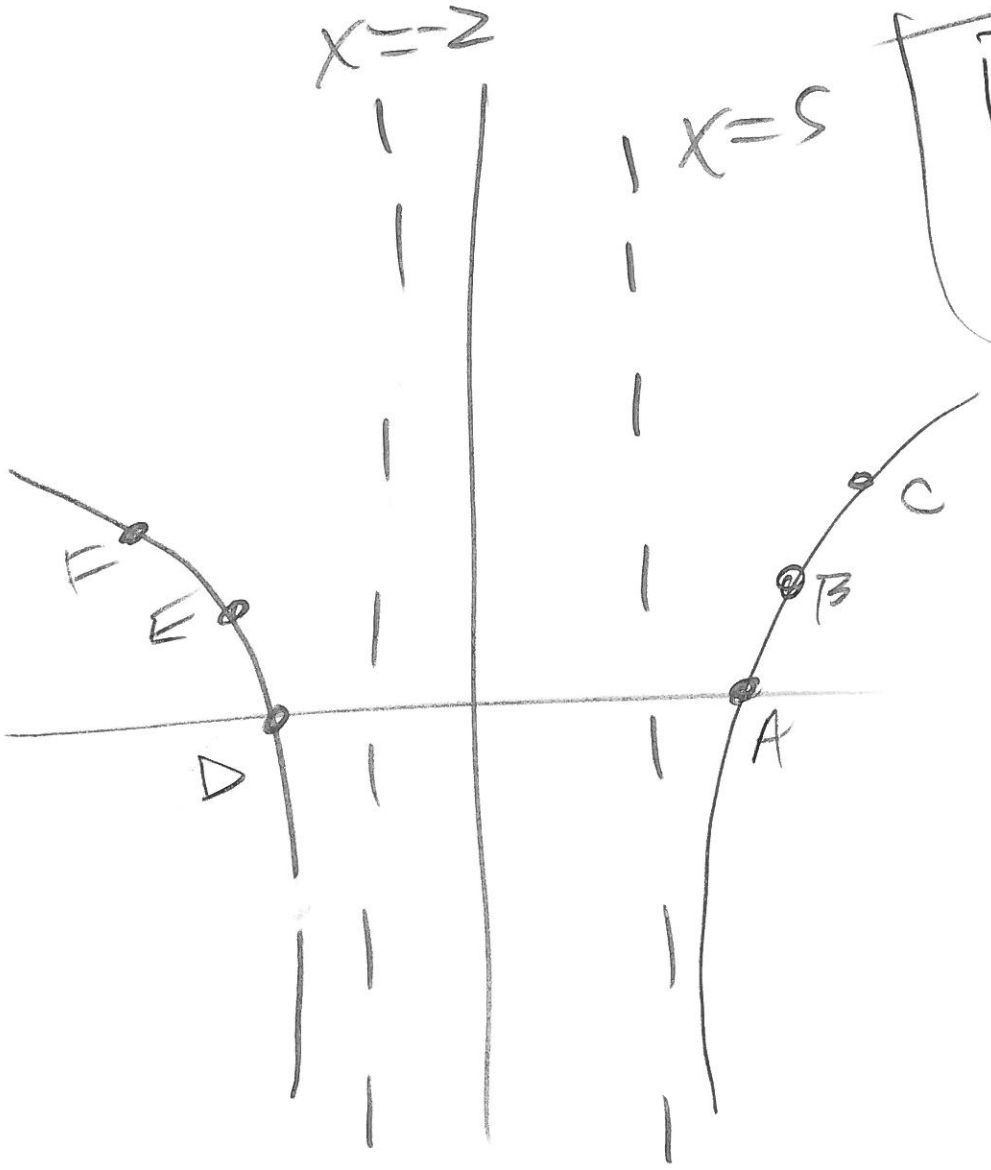
$$\left(\frac{3+\sqrt{65}}{2},2\right)\approx(5.531,2)\ (E)$$

$$\left(\frac{3-\sqrt{65}}{2},2\right)\approx(-2.531,2)\ (F)$$



$$f(x) = \log_2(x^2 - 3x - 10)$$

typo fixed



D: $x < -2$ or $x > 5$

	x	y
D	$\frac{3-\sqrt{53}}{2}$	0
E	$\frac{3-\sqrt{57}}{2}$	1
F	$\frac{3-\sqrt{65}}{2}$	2

$\approx$

x	y
-2.140	0
-2.275	1
-2.531	2

	x	y
A	$\frac{3+\sqrt{53}}{2}$	0
B	$\frac{3+\sqrt{57}}{2}$	1
C	$\frac{3+\sqrt{65}}{2}$	2

x	y
2.140	0
2.275	1
2.531	2

$$f(x) = \log_6 (x^2 + 4x)$$

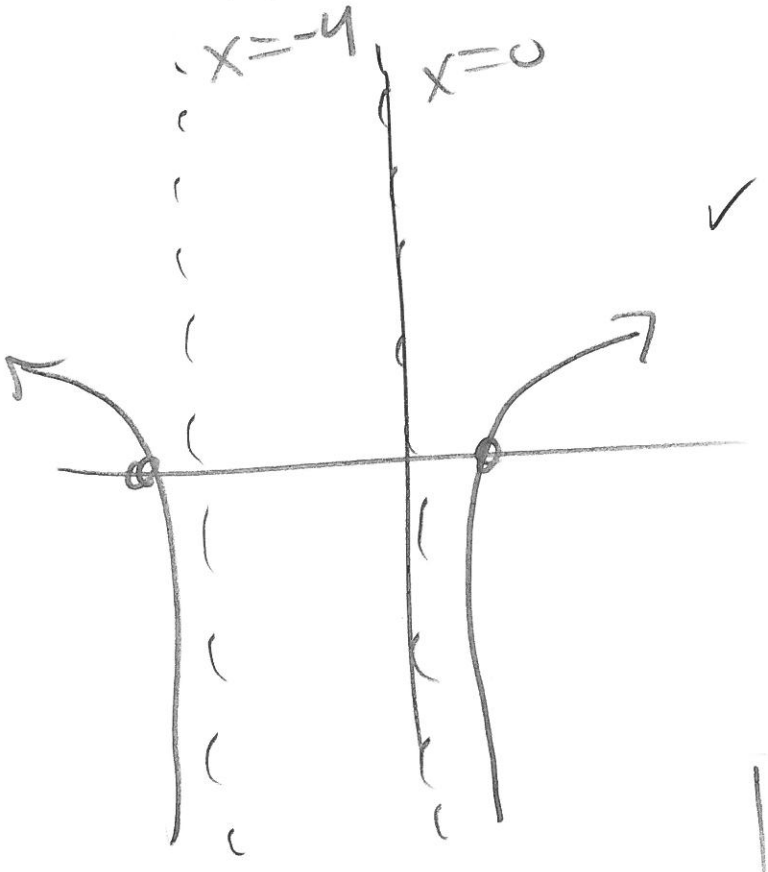
base

Solve $x^2 + 4x = 0$

$x(x+4) = 0$

$\boxed{x=0}$ $\boxed{x=-4}$

✓ $\log_6 (0+0) = \log 0$ not defined at $x=0$



$x<-4$ $x>0$

✓ $\log_6 ((-1)^2 + 4(-1))$

$\log_6 (1-4)$

$\log_6 (-3)$

not defined at $x=-1$

$\boxed{\text{D: } x<-4 \quad x>0}$

$f(x) = \log_6(x^2+4x)$

Solve $x^2+4x = 1$

$x^2+4x - 1 = 0$

not factorable

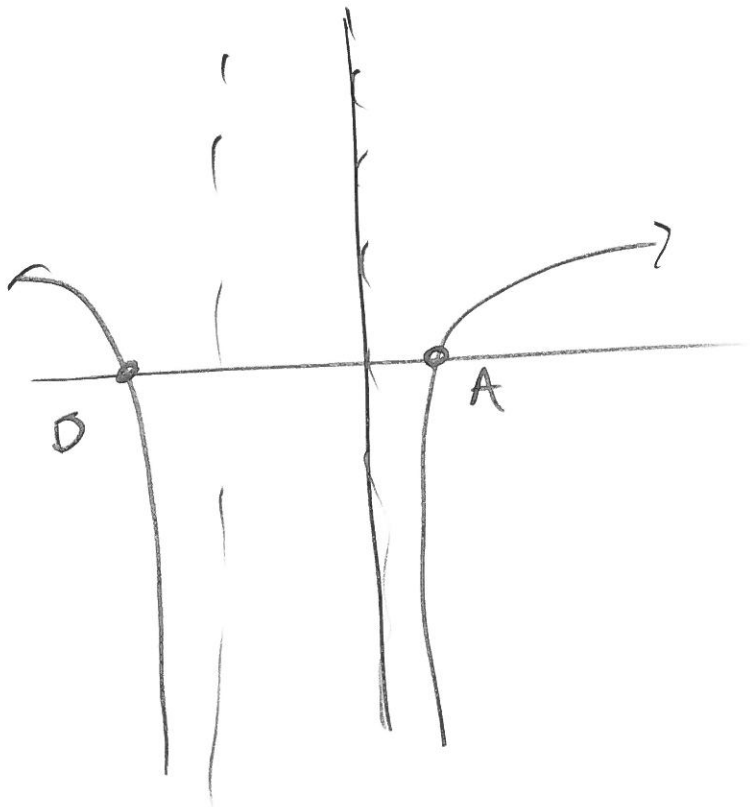
$D = (4)^2 - 4(1)(-1)$

$D = 32$

$x = \frac{-4 \pm \sqrt{32}}{2}$

$x \approx 0.828$ (A)

$x \approx -4.828$ (D)



$\left(\frac{4-\sqrt{32}}{2}, 0\right)$ D

$\left(\frac{4+\sqrt{32}}{2}, 0\right)$ (A)

x intercepts

Solve $x^2+4x=6$ ← Power of base

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

→ not factorable

$D=(4)^2-4(1)(-6)$

$D=40$

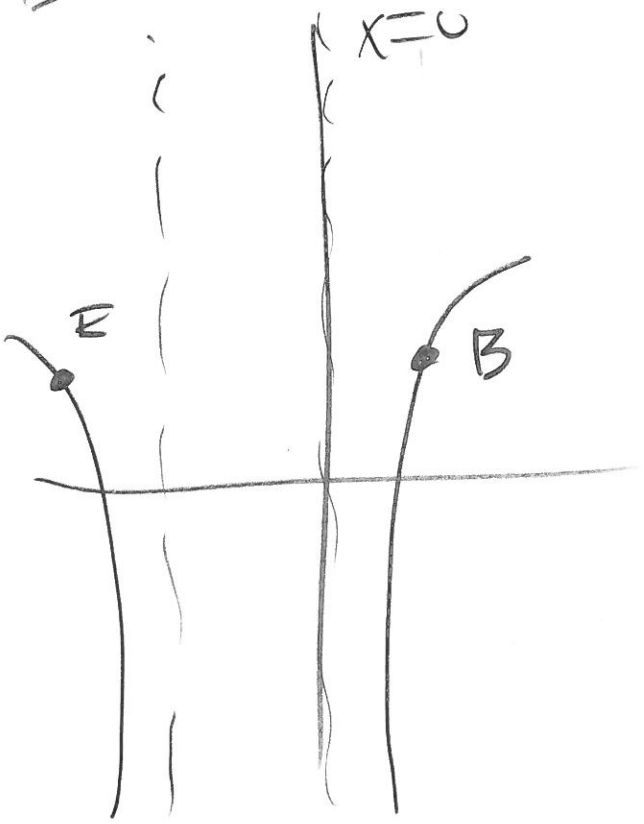
$x=\frac{-4\pm\sqrt{40}}{2}$

$x\approx 1.162$

$x\approx -5.162$

$\left(\frac{-4+\sqrt{40}}{2}, 1\right)$ B

$\left(\frac{-4-\sqrt{40}}{2}, 1\right)$ E



$x=4$

Solve $x^2+4x = 36$ & Power of Logs

$$x^2+4x-36=0$$

not factorable

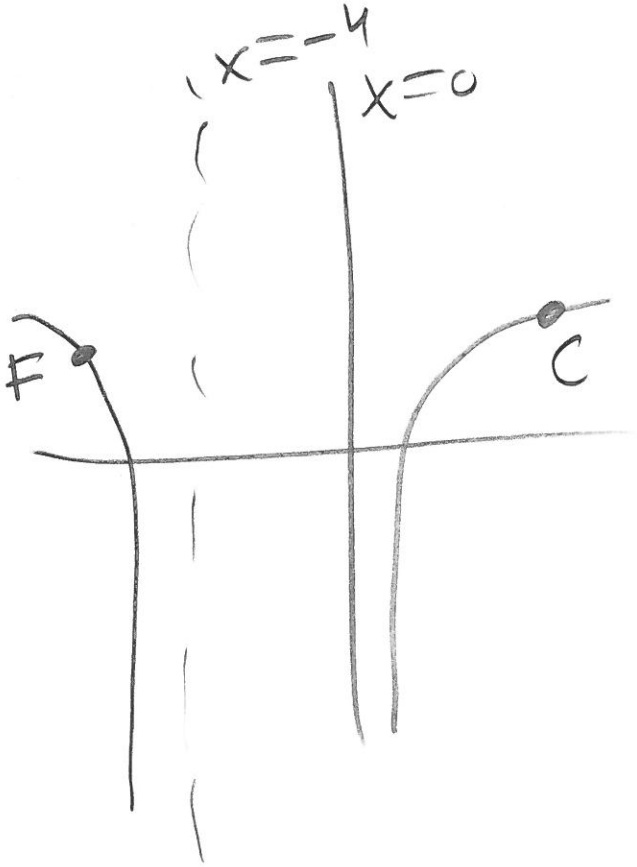
$D = (4)^2 - 4(1)(-36)$

$D = 160$

$x = \frac{-4 \pm \sqrt{160}}{2}$

$x \approx 4.325$

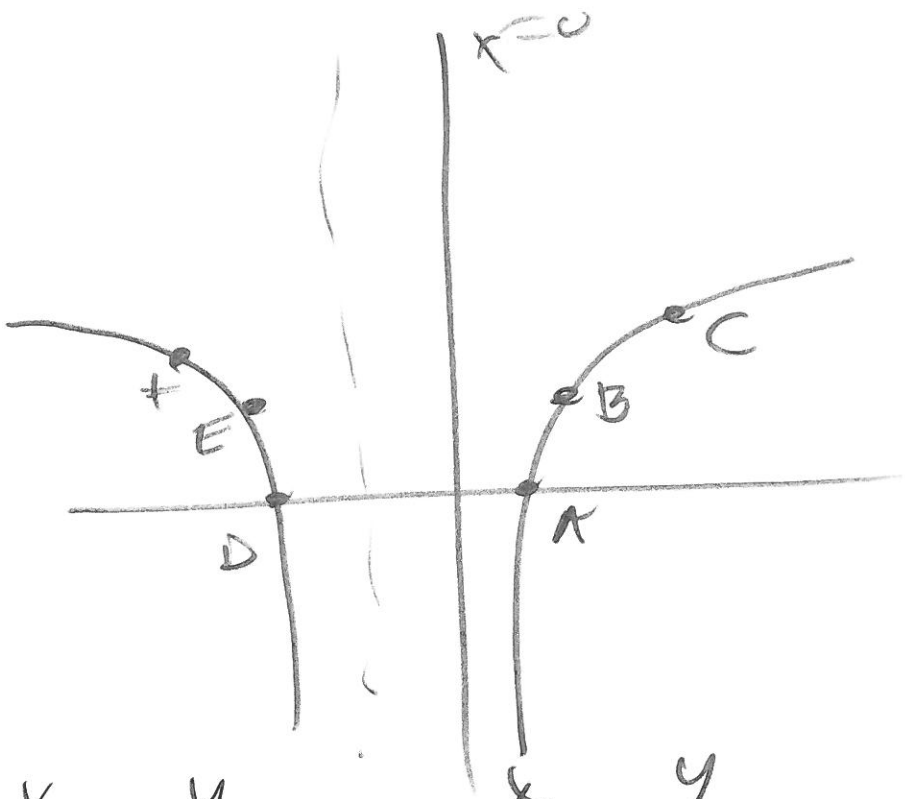
$x \approx -8.325$



$\left(\frac{-4+\sqrt{160}}{2}, 2\right)$

$\left(\frac{-4-\sqrt{160}}{2}, 2\right)$

$$f(x) = \log_6(x^2+4x)$$



	x	y		x	y
A	$\frac{-4+\sqrt{32}}{2}$	0	A	0.828	0
B	$\frac{-4+\sqrt{40}}{2}$	1	B	-1.162	1
C	$\frac{-4+\sqrt{160}}{2}$	2	C	4.325	2

	x	y		x	y
D	$\frac{-4-\sqrt{32}}{2}$	0	D	-4.828	0
E	$\frac{-4-\sqrt{40}}{2}$	1	E	-5.162	1
F	$\frac{-4-\sqrt{160}}{2}$	2	F	-8.435	2

Determine each of the solutions of these equations AS IF YOU ONLY had LOG and LN buttons on your calculators NO LOG base b button exists!

1. $15(2)^{3x-5} + 32 = 92$

Exact answer _____ approximate answer if necessary _____

2. $18\ln(3x + 6) - 7 = 11$

Exact answer _____ approximate answer if necessary _____

3. $6(10)^{6x-3} - 1 = 119$

Exact answer _____ approximate answer if necessary _____

Determine each of the solutions of these equations AS IF YOU ONLY had LOG and LN buttons on your calculators NO LOG base b button exists! (if no answer exist explain WHY NOT!)

1. $-3\log(2x+4)+5=95$

Exact answer _____ approximate answer if necessary _____

2. $8\left(\frac{3}{2}\right)^{2x+12}-18=46$

Exact answer _____ approximate answer if necessary _____

3. $2(e)^{-2x+4}+12=-4$

Exact answer _____ approximate answer if necessary _____

Solve

① $15(2)^{3x-5} + 32 = 92$

T
leave
alone

$15(2)^{3x-5} + 32 = 92$
$\quad -32 \quad -32$

$15(2)^{3x-5} = 60$

$\frac{15(2)^{3x-5}}{15} = \frac{60}{15}$

$(2)^{3x-5} = 4$

Now to solve this equation

$2^{3x-5} = 4$

related

Solution

$x = \frac{7}{3} = 2\frac{1}{3}$

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

same

$\cancel{2}^{3x-5} = \cancel{2}^{2}$

$3x - 5 = 2$

$+5 \quad +5$

$3x = 7$

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

$x = 7/3 = 2\frac{1}{3} = 2.\overline{3}$

✓✓

$15(2^{(3\cdot(\frac{7}{3})-5)}) + 32$

$15(2^{7-5}) + 32$

$15(2^2) + 32$

$60 + 32$

92 ✓✓

Solve Method ②

$$x = \frac{7}{3} = 2\frac{1}{3} = 2.\overline{3}$$

From

$$2^{3x-5} = 4$$

Apply log

① $\log 2^{3x-5} = \log 4$

② $(3x-5)\log 2 = \log 4$

③ $\frac{(3x-5)(\log 2)}{\log 2} = \frac{\log 4}{\log 2}$

④ $3x-5 = \frac{\log 4}{\log 2} = \log_2 4$

⑤ $3x-5+5 = 5 + \frac{\log 4}{\log 2} = 5 + \log_2 4$

⑥ $\frac{3x}{3} = \frac{5 + \frac{\log 4}{\log 2}}{3} = \frac{5 + \log_2 4}{3}$

$= \frac{5+2}{3} = \frac{7}{3}$

Solve for Method (3)

$$2^{3x-5} = 4$$

Apply $\log_2$ —

---

① $\log_2 2^{3x-5} = \log_2 4$

$3x-5 = \log_2 4$

② $3x-5+5 = 5+\log_2 4$

③ $3x = 5+\log_2 4$

④ $\frac{3x}{3} = \frac{5+\log_2 4}{3}$

$x = \frac{5+\log_2 4}{3} = \frac{5+2}{3}$

$x = \frac{7}{3} = 2\frac{1}{3} = 2.\overline{3}$

(2) $18\ln(3x+6) - 7 = 11$

leave alone

(1) $18\ln(3x+6) - 7 = 11$
$+7 \quad +7$

$18\ln(3x+6) = 18$

(2) $\frac{18\ln(3x+6)}{18} = \frac{18}{18}$

$\ln(3x+6) = 1$

Apply "e" as a base (inverse of ln)

$e^{\ln(3x+6)} = e^1$

$3x+6 = e^1$
$-6 \quad -6$

$3x = -6 + e^1$

$x = \frac{-6+e^1}{3} \approx -1.094$

(2) √√

$$18\ln\left(3\left(\frac{-6+e^1}{3}\right)+6\right)-7$$

$$18\ln\left(-6+e^1+6\right)-7$$

$$18\ln\left(e^1\right)-7$$

$$18(1)-7=11$$

√√

≈ √√

$$18\ln\left(3(-1.094)+6\right)-7$$

$$\approx 10.998$$

③ $6(10)^{6x-3} - 1 = 119$

leave alone

$6(10^{6x-3}) - 1 = 119$

$+1 \quad +1$

$6(10^{6x-3}) = 120$

$\frac{6(10^{6x-3})}{6} = \frac{120}{6}$

$\boxed{10^{6x-3} = 20}$

Method (1) Apply Log

① $\log 10^{6x-3} = \log 20$

② $(6x-3)\log 10 = \log 20$

③ $\frac{(6x-3)\log 10}{\log 10} = \frac{\log 20}{\log 10}$

$6x-3 = \frac{\log 20}{\log 10} = \log_{10} 20$

④ $6x-3+3 = 3+\log_{10} 20$

⑤ $6x = 3+\frac{\log 20}{\log 10} \rightarrow \frac{6x}{6} = \frac{3+\frac{\log 20}{\log 10}}{6}$

$\boxed{x \approx 0.717}$ $\boxed{x = \frac{3+\log 20}{6}}$

Solve $10^{6x-3} = 20$

Apply $\log_{10}$ — (inverse of 10^x)

① $\log_{10} 10^{6x-3} = \log_{10} 20$

$6x-3 = \log_{10} 20$

$6x-3+3 = 3 + \log_{10} 20$

$6x = 3 + \log_{10} 20$

$$x = \frac{3 + \log_{10} 20}{6}$$

$x \approx 0.717$

① $-3\log(2x+4)+5=95$

leave alone: $-5 \quad -5$

$$-3\log(2x+4)=90$$

$$\frac{-3\log(2x+4)}{-3}=\frac{90}{-3}$$

$$\log(2x+4)=-30$$

$$\log(2x+4)=-30$$

Method ① Apply 10 as base (inverse of log)

$$10^{\log_{10}(2x+4)}=10^{-30}$$

$$2x+4=10^{-30}$$

$$2x+4-4=-4+10^{-30}$$

$$2x=-4+10^{-30}$$

$$\frac{2x}{2}=\frac{-4+10^{-30}}{2}$$

correct → $x=\frac{-4+10^{-30}}{2}\simeq -2$ ← incorrect of just -2

Method ②

$$\log_{10}(2x+4) = -30$$

$$10^{-30} = 2x+4$$

$$10^{-30} - 4 = 2x + 4 - 4$$

$$-4 + 10^{-30} = 2x$$

$$\frac{-4+10^{-30}}{2} = \frac{2x}{2}$$

$$x = \frac{-4+10^{-30}}{2}$$

$x \approx -2$

not $= -2$

≈ -2

VV

$$-3\log\left(2\left(\frac{-4+10^{-30}}{2}\right)+4\right) + 5$$

$$-3\log(-4+10^{-30}+4) + 5$$

$$-3\log(10^{-30}) + 5$$

$$-3(-30) + 5 = 90 + 5 = 95$$

VV But

$$-3(\log[2(-2)+4]+5 \neq 95$$

$$-3(\log(-4+4)+5$$

$$-3\log(0)+5$$

$\log(0)$ ↓ undefined

So $x = \frac{-4+10^{-30}}{2}$ is a solution

$x \approx -2$ not a solution

(2) $8\left(\frac{3}{2}\right)^{2x+12} - 18 = 46$

leave alone

$+18 \quad +18$

$8\left(\frac{3}{2}\right)^{2x+12} = 64$

$\frac{8\left(\frac{3}{2}\right)^{2x+12}}{8} = \frac{64}{8}$

$\boxed{\left(\frac{3}{2}\right)^{2x+12} = 8}$

Method (1) Apply $\log_{\frac{3}{2}}$ — (inverse of $\left(\frac{3}{2}\right)^x$)

$\log_{\frac{3}{2}}\left(\left(\frac{3}{2}\right)^{2x+12}\right) = \log_{3/2}(8)$

$2x+12 = \log_{3/2} 8$

$-12 \quad -12$

$2x = -12 + \log_{3/2} 8$

$\boxed{x = \frac{-12 + \log_{3/2} 8}{2} \approx -3.436}$

Solve $\left(\frac{3}{2}\right)^{2x+12} = 8$

Method 2 Apply LOG

① $\log\left(\frac{3}{2}\right)^{2x+12} = \log 8$

② $(2x+12)\log\frac{3}{2} = \log 8$

③ $\frac{(2x+12)(\log\frac{3}{2})}{\log\frac{3}{2}} = \frac{\log 8}{\log\frac{3}{2}}$

④ $2x+12 = \frac{\log(8)}{\log(3/2)}$

⑤ $2x+12-12 = -12 + \frac{\log 8}{\log 3/2}$

$2x = -12 + \frac{\log 8}{\log 3/2}$

$\frac{2x}{2} = \frac{-12 + \frac{\log 8}{\log 3/2}}{2}$

$x \approx -3.436$

$$x = \frac{-12 + \frac{\log 8}{\log 3/2}}{2} \quad \text{or} \quad \frac{-12 + \log_{3/2} 8}{2}$$

(VI) $8\left(\frac{3}{2}\right)^{2\left(\frac{-12+\log_{3/2}8}{2}\right)+12} - 18 =$

$8\left(\frac{3}{2}\right)^{-12+\log_{3/2}8+12} - 18 =$

$8\left(\frac{3}{2}\right)^{\log_{3/2}8} - 18 =$

$8\left(\frac{3}{2}\right)^{\log_{3/2}8} - 18$

$8(8) - 18$

$64 - 18 = 46$

$\approx 8\left(\frac{3}{2}\right)^{2(-3.436)+12} - 18$

$\approx 45.986 \approx 46$

(3) $2e^{-2x+4} + 12 = -4$

$-12 \quad -12$

$$2e^{-2x+4} = -16$$

$$\frac{2e^{-2x+4}}{2} = \frac{-16}{2}$$

$$e^{-2x+4} = -8$$

Impossible $e^{f(x)} > 0$ always

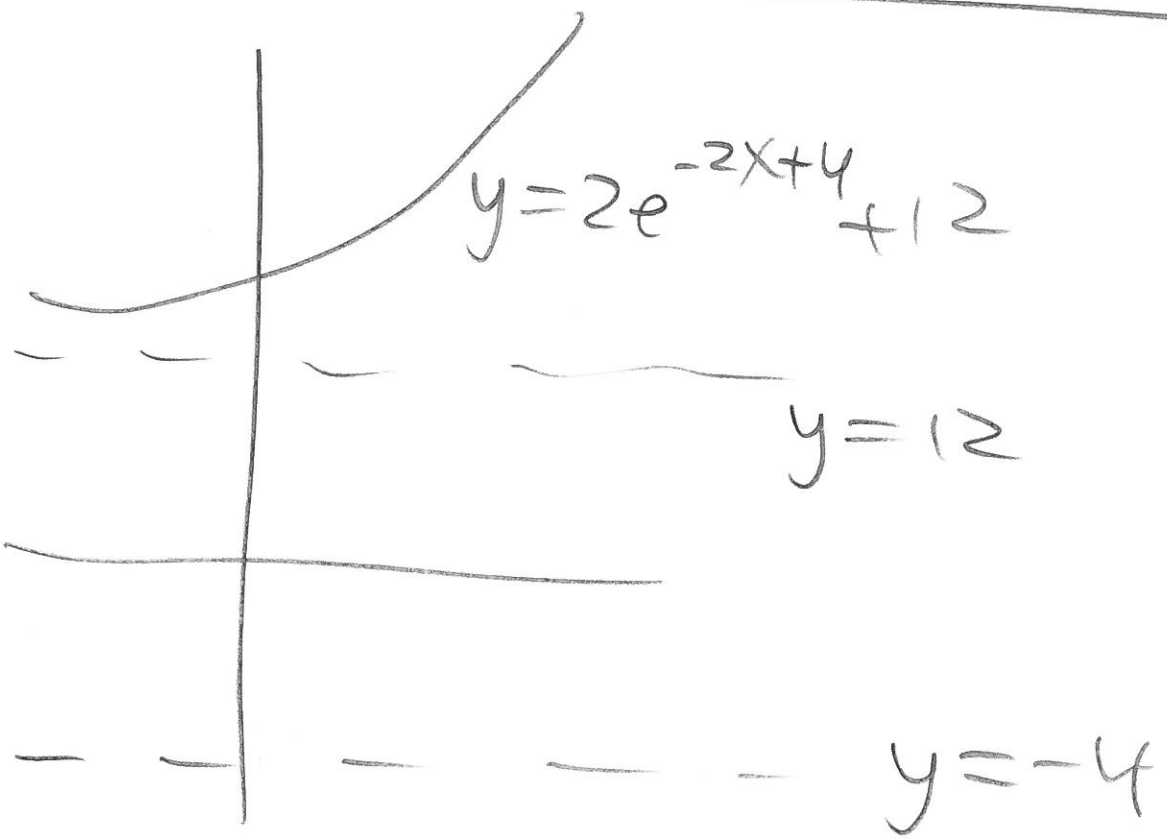
or ~~$\ln e^{-2x+4}$~~ $= \ln -8$

$-2x+4 = \ln(-8)$ → math domain error

NO solution?

Graphic Reason why

No Solution



$y = -4$ & $f(x) = 2e^{-2x+4} + 12$

never cross!