3.4 #41

$$\left(\frac{2c-3}{5}\right)^2 + 2\left(\frac{2c-3}{5}\right) = 8$$

is quadratic in $u = \frac{2c-3}{5}$

$\boxed{\text{Let } u = \frac{2c-3}{5}}$. Then

$AB = 0 \longrightarrow$

$A = 0$ OR $B = 0$

$u^2 + 2u = 8$

$u^2 + 2u - 8 = 0$

$(u+4)(u-2) = 0$

$u = -4$ OR $u = 2$

$\frac{2c-3}{5} = -4$ $\qquad$ $\frac{2c-3}{5} = 2$

$2c - 3 = -20$ $\qquad$ $2c - 3 = 10$

$2c = -17$ $\qquad$ $2c = 13$

$c = -\frac{17}{2}$ OR $c = \frac{13}{2}$

$c \in \left\{-\frac{17}{2}, \frac{13}{2}\right\}$

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3.4

7. $3y^4 - 12y^2 = 0$

$$3y^2(y^2-4) = 0$$

$3y^2 = 0$ or $y^2 - 4 = 0$ $\qquad$ $y^2 = 4$

$y^2 = 0$ $\qquad (y+2)(y-2) = 0$ $\qquad y = \pm\sqrt{4} = \pm 2$

$y = \pm 0$ $\qquad y = -2$ or $y = 2$

$$y \in \{-2, 0, 2\}$$

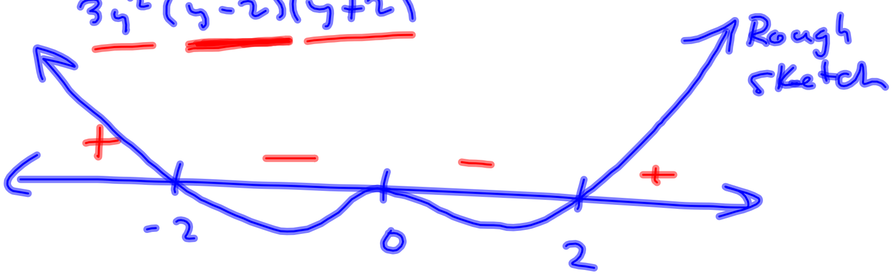
$y = 0, \pm 2$ are only 3 zeros
what up wit' dat?

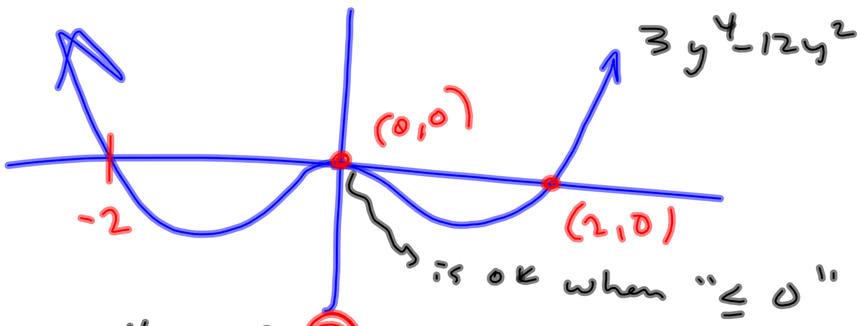
$$3y^2(y^2-4) = 3y^2(y-2)(y+2)$$

$y = 0$ is a root of mulipliciity 2

Tie-together w/ graphing

$3y^2(y-2)(y+2)$





Solve $3y^4 - 12y^2 < 0$

$y \in [-2, 0) \cap (0, 2] = \emptyset$ No

$(-2, 0) \cup (0, 2)$ Yes

$$3y^4 - 12y^2 \le 0$$

$$[-2, 0] \cup [0, 2] = [-2, 2]$$

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§3.4 #35

$x^4 - 12x^2 + 27 = 0$ is quadratic in $u = x^2$

Let $u = x^2$

$u^2 - 12u + 27 = 0$ etc.

$x^2 = 3$ OR $x^2 = 9$

$x^{\frac{2}{3}} - 12x^{\frac{1}{3}} + 27 = 0$

Let $u = x^{\frac{1}{3}}$

$u^2 - 12u + 27 = 0$

$u = 3$ OR $u = 9$

$x^{\frac{1}{3}} = 3$ OR $x^{\frac{1}{3}} = 9$

$(x^{\frac{1}{3}})^3 = 3^3$ $\quad x = 9^3$

$x = 27$ $\quad x = 729$

$$\begin{array}{r} 81 \\ 9 \\ \hline 729 \end{array}$$

$\ln x = \log_e x$

$\ln(x^{\frac{1}{3}}) = \ln(3)$

$\frac{1}{3}\ln(x) = \ln(3)$

$\ln(x) = 3\ln(3) = \ln(3^3)$

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

$x = 3^3$

$\log(xy)$
$= \log x + \log y$

9.7 Computer

$\log(9 \cdot 7)$ turns products into sums
$= \log 9 + \log 7$

$\log(x^y)$
$= y \log x$

It adds.
Then takes the inverse log.

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

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

$$x+1 = (x-5)^2 = x^2-10x+25$$

$$-x-1 = -x-1$$

$$0 = x^2-11x+24 = 0$$

$$(x-8)(x-3) = 0$$

$$x \in \{3, 8\}$$

$$\left(\left(\quad\right)^{\frac{1}{2}}\right)^2$$

Fact: $A = B \Rightarrow A^2 = B^2$

But $A^2 = B^2 \cancel{\Rightarrow} A = B$

$$(-3)^2 = 9 = 3^2$$

But

$$-3 \neq +3$$

Squaring both sides is like casting a net. Sometimes we have to throw a fish back.

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

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

$x+1 = (x-5)^2 = x^2-10x+25 \Rightarrow$

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

$0 = x^2-11x+24 = 0$

$(x-8)(x-3) = 0$

$x \in \{3, 8\}$

$\{8\}$ is sol'n set

$x=3$ is extraneous root.

CHECK!

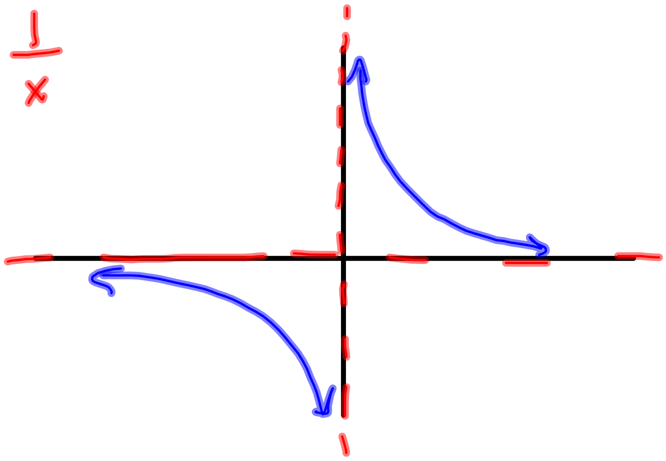
$\sqrt{3+1} = 3-5$

$2 = \sqrt{4} = -2$ Newp

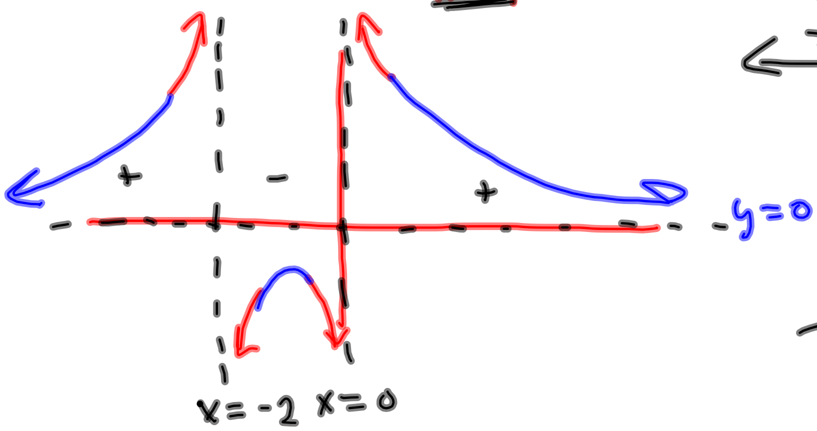
$\sqrt{8+1} \stackrel{?}{=} 8-5$

$3 = 3$ ✓

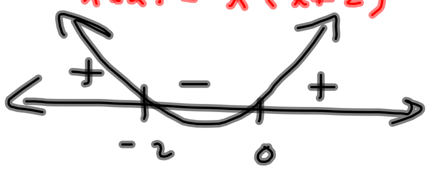
$f(x) = \frac{1}{x}$



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



$h(x) = x^1(x+2)$



$\frac{1}{.0000000001}$ is

BIG

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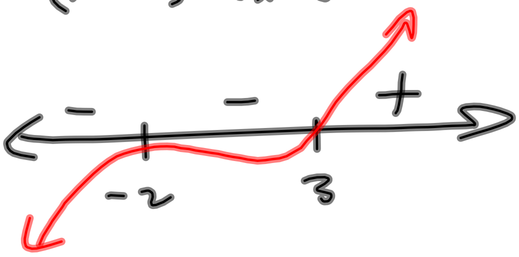
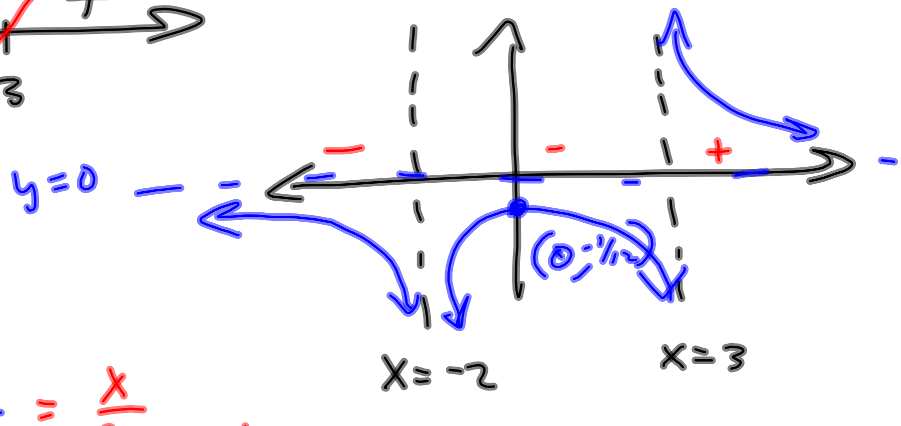
$(x+2)^2(x-3)$



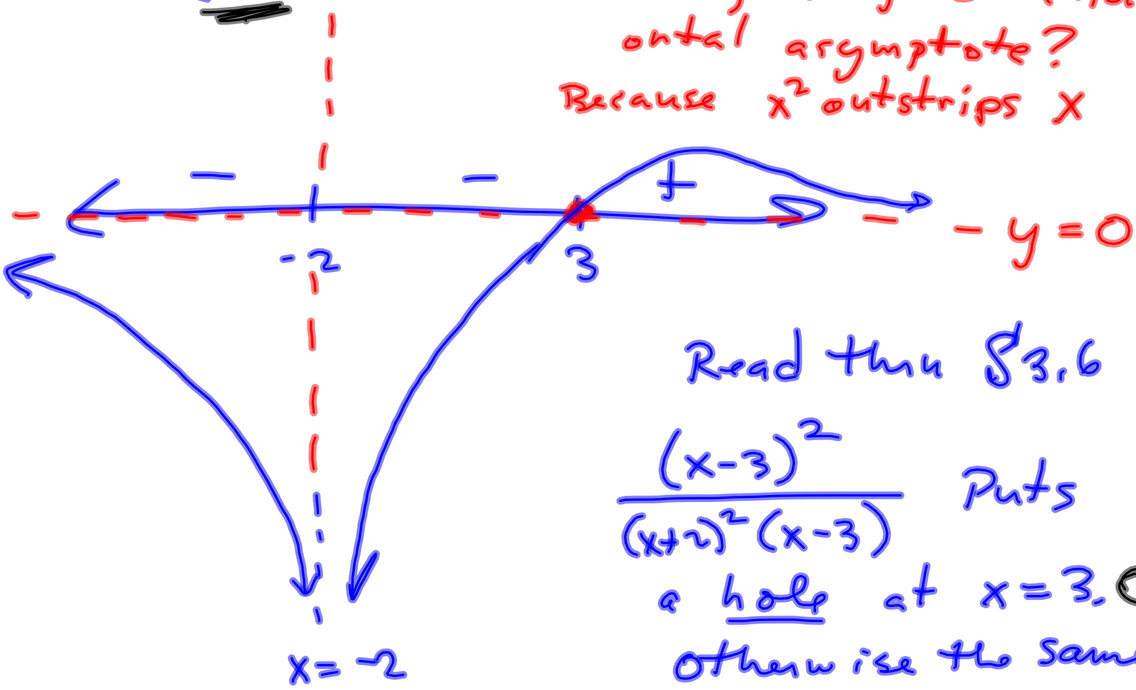
$$\frac{1}{(x-3)(x+2)^2}$$



$$\frac{x-3}{(x+2)^2} = \frac{x}{x^2+\text{smaller}}$$

why is $y=0$ a Horizontal asymptote?

Because x^2 outstrips x



Read thru §3.6

$$\frac{(x-3)^2}{(x+2)^2(x-3)}$$ Puts a hole at $x=3$.

otherwise the same.