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

$\mathcal{D}(f)$: Need $x-4 \neq 0$

$\Rightarrow x \neq 4$

OR

$\Rightarrow \mathcal{D}(f) = \{x \mid x \neq 4\} = \mathbb{R} \setminus \{4\} = (-\infty, 4) \cup (4, \infty)$

AND

What's $(-\infty, 4) \cap (4, \infty) = \emptyset$

$x < 4$ $x > 4$

4

No overlap & AND needs overlap!

$g(x) = \sqrt{x+5}$

$\mathcal{D}(g)$: Need $x+5 \geq 0$

$\Rightarrow x \geq -5$

$\mathcal{D}(g) = \{x \mid x \geq -5\} = [-5, \infty)$

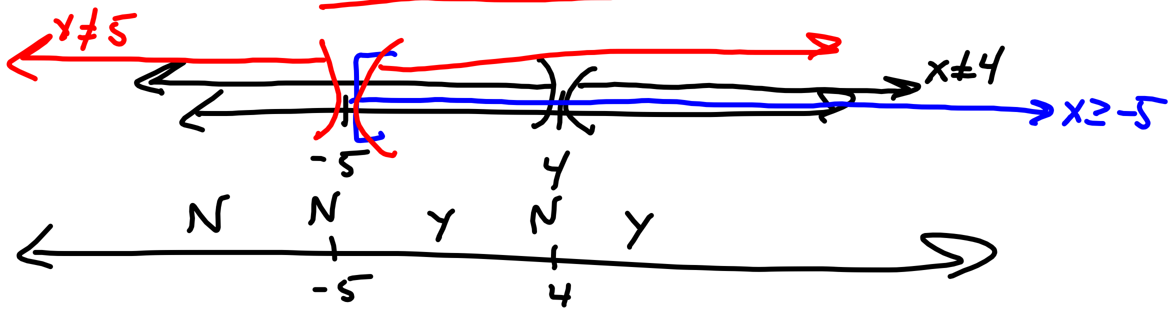
$$\boxed{\frac{f}{g} = \frac{\frac{1}{x-4}}{\sqrt{x+5}}}$$

$\mathcal{D}(f/g) = \{x \mid \underline{x \in \mathcal{D}(f) \text{ AND } x \in \mathcal{D}(g)} \text{ AND } g(x) \neq 0\}$

$A \cap B = A \underline{\text{ and }} B = \{x \mid x \in A \text{ and } x \in B\}$

So we re-write $\mathcal{D}(\frac{f}{g})$ as

$\{x \mid \underline{x \in \mathcal{D}(f) \cap \mathcal{D}(g)} \text{ and } g(x) \neq 0\}$



$= (-5,4) \cup (4,\infty)$

$\{x \mid x \in \mathcal{D}(f) \cap \mathcal{D}(g) \cap \{x \mid x \neq -5\}\}$

$f(x)=\frac{1}{x-4}$, $g(x)=\sqrt{x+5}$

$\mathcal{D}(f)=\mathbb{R}\setminus\{4\}$, $\mathcal{D}(g)=[-5,\infty)$

$f\circ g=(f\circ g)(x)=f(g(x))$

$\mathcal{D}(f\circ g)=\{x \mid \underbrace{x\in\mathcal{D}(g)}_{g \text{ eats } x} \text{ AND } \underbrace{g(x)\in\mathcal{D}(f)}_{f \text{ eats } g(x)}\}$

$=\{x \mid x\geq -5 \text{ and } g(x)\neq 4\}$

$\mathcal{D}(f)=\mathbb{R}\setminus\{4\}=\{x \mid x\neq 4\}$

$g(x)\neq 4$ scratch (ANALYSIS)

$\sqrt{x+5}\neq 4$ Need it. $)^2$ $()^2$

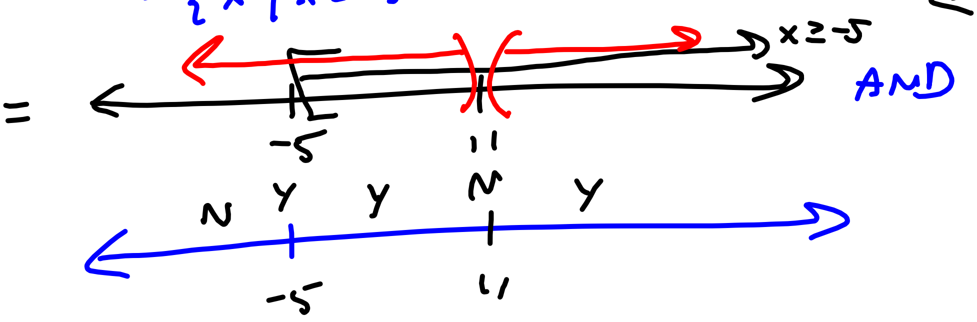
$(\sqrt{x+5})^2\neq 4^2$

$x+5\neq 16$

$x\neq 11$

$=\{x \mid x\geq -5 \text{ and } x\neq 11\}$

=



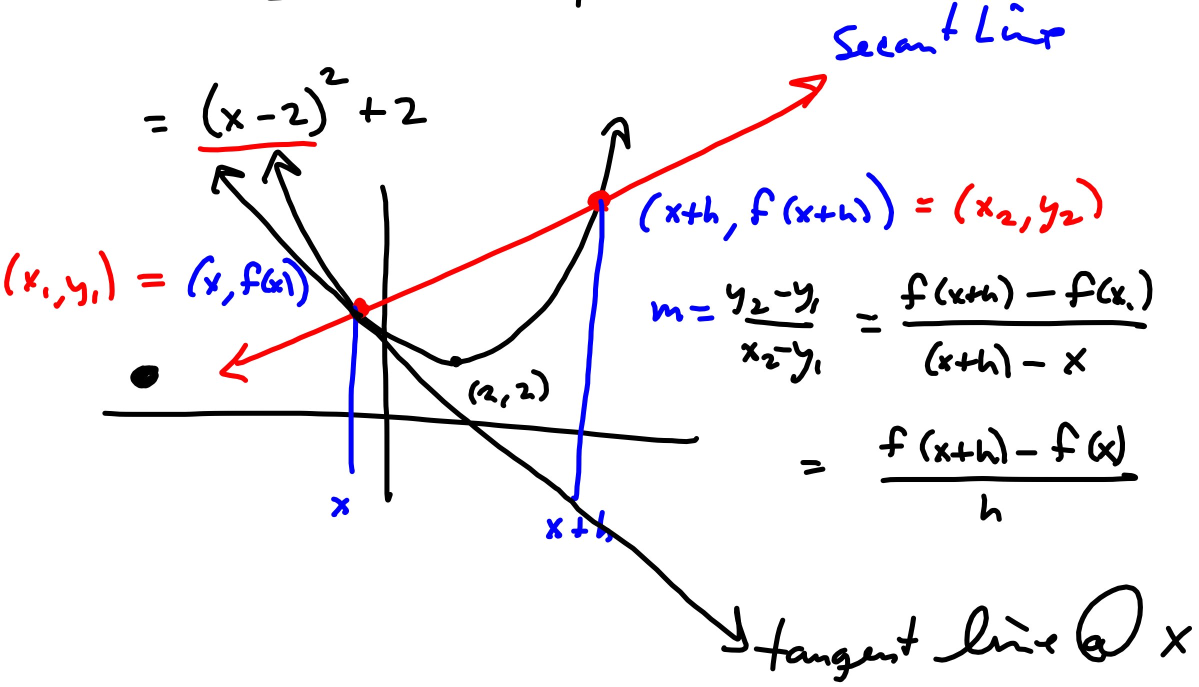
$=[-5,11)\cup(11,\infty)$

$$f(x) = x^2 - 4x + 6$$

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

$$\frac{4}{2} = 2 \rightsquigarrow 2^2 = 4$$

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



$$m = \frac{y_2 - y_1}{x_2 - y_1} = \frac{f(x+h) - f(x_1)}{(x+h) - x}$$

$$= \frac{f(x+h) - f(x)}{h}$$

$$= \frac{(x+h)^2 - 4(x+h) + 6 - (x^2 - 4x + 6)}{h}$$

5 $$= \frac{x^2 + 2xh + h^2 - 4x - 4h + 6 - x^2 + 4x - 6}{h}$$

$$= \frac{2xh + h^2 - 4h}{h} = \frac{h(2x + h - 4)}{h} = \boxed{2x + h - 4}$$

Bonus $$2x+h-4 \xrightarrow{h \to 0} \boxed{2x - 4 = f'(x)}$$ CALC I

$(3x+2)(5x-1) = 15x^2 - 3x + 10x - 2$

$= 15x^2 + 7x - 2$

SET $= 0$ $\Longrightarrow$ $x = -\frac{2}{3}, \frac{1}{5}$

C3: Rational Zeros Theorem.

$\frac{p}{q}$ makes it zero?

Then p's a factor of the last term

& q's a factor of the first term

$P(x) = 15x^5 + \cdots\cdots + 14$

Guess the rational zeros

The answers on tests will be out of the 1st couple.

"$\frac{14}{15}$" $\frac{p}{q} = \pm 1, \pm 2, \pm 7, \pm 14$

$\pm\frac{1}{3}, \pm\frac{2}{3}, \pm\frac{7}{3}, \pm\frac{14}{3},$

$\pm\frac{1}{5}, \pm\frac{2}{5}, \pm\frac{7}{5}, \pm\frac{14}{5},$

$\pm\frac{1}{15}, \pm\frac{2}{15}, \pm\frac{7}{15}, \pm\frac{14}{15}$

Possible Rationals.

$f(x) = x^5 + 5x^4 - 3x^3 + x - 7$

Find $f(3)$

I'm dividing by $x-3$

$$\begin{array}{r|rrrrrr} 3 & 1 & 5 & -3 & 0 & 1 & -7 \\ & & 3 & 24 & 63 & 189 & 570 \\ \hline & 1 & 8 & 21 & 63 & 190 & 563 \end{array}$$

Remainder

$$\begin{array}{r} 63 \\ \times\ 3 \\ \hline 189 \end{array} \qquad \begin{array}{r} {}^{2}190 \\ \times\ 3 \\ \hline 570 \end{array}$$

$$\begin{array}{r} 190 \text{ r } 1 \\ 3\overline{)571} \\ -300 \\ \hline 271 \\ -270 \\ \hline 1 \end{array}$$

This says

$$\frac{571}{3} = 190 + \frac{1}{3}$$

$$\left(\frac{571}{3} = 190 + \frac{1}{3}\right)(3)$$

$$\Rightarrow \quad 571 = (190)(3) + 1$$

$f(x) = x^5 + 5x^4 - 3x^3 + x - 7$ 11

Find $f(3)$

$$\begin{array}{r|rrrrrr} 3 & 1 & 5 & -3 & 0 & 1 & -7 \\ & & 3 & 24 & 63 & 189 & 570 \\ \hline & 1 & 8 & 21 & 63 & 190 & 563 \end{array}$$

I'm dividing by $x-3$

Remainder

$$\frac{f(x)}{x-3} = x^4 + 8x^3 + 21x^2 + 63x + 190 + \frac{563}{x-3}$$

$$\frac{571}{3} = 190 + \frac{1}{3}$$

$$570 = (190)(3) + 1$$

$$f(x) = (x^4 + 8x^3 + 21x^2 + 63x + 190)(x-3) + 563$$