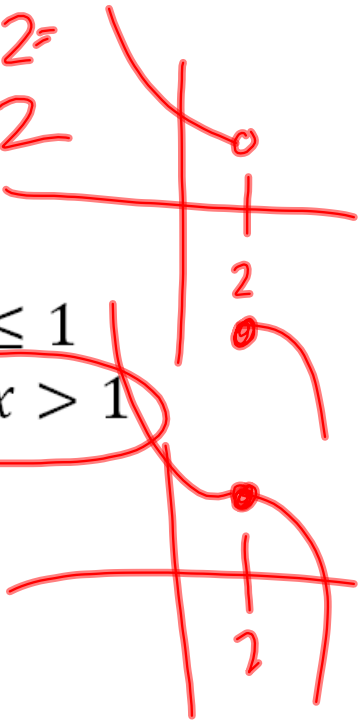
$2^2 - 4(2) + 6 = 2$

1.4 #16. $f(x) = \begin{cases} x^2 - 4x + 6, & x < 2 \\ -x^2 + 4x - 2, & x \geq 2 \end{cases}$

$\lim_{x \to 2} f(x) =$ 2

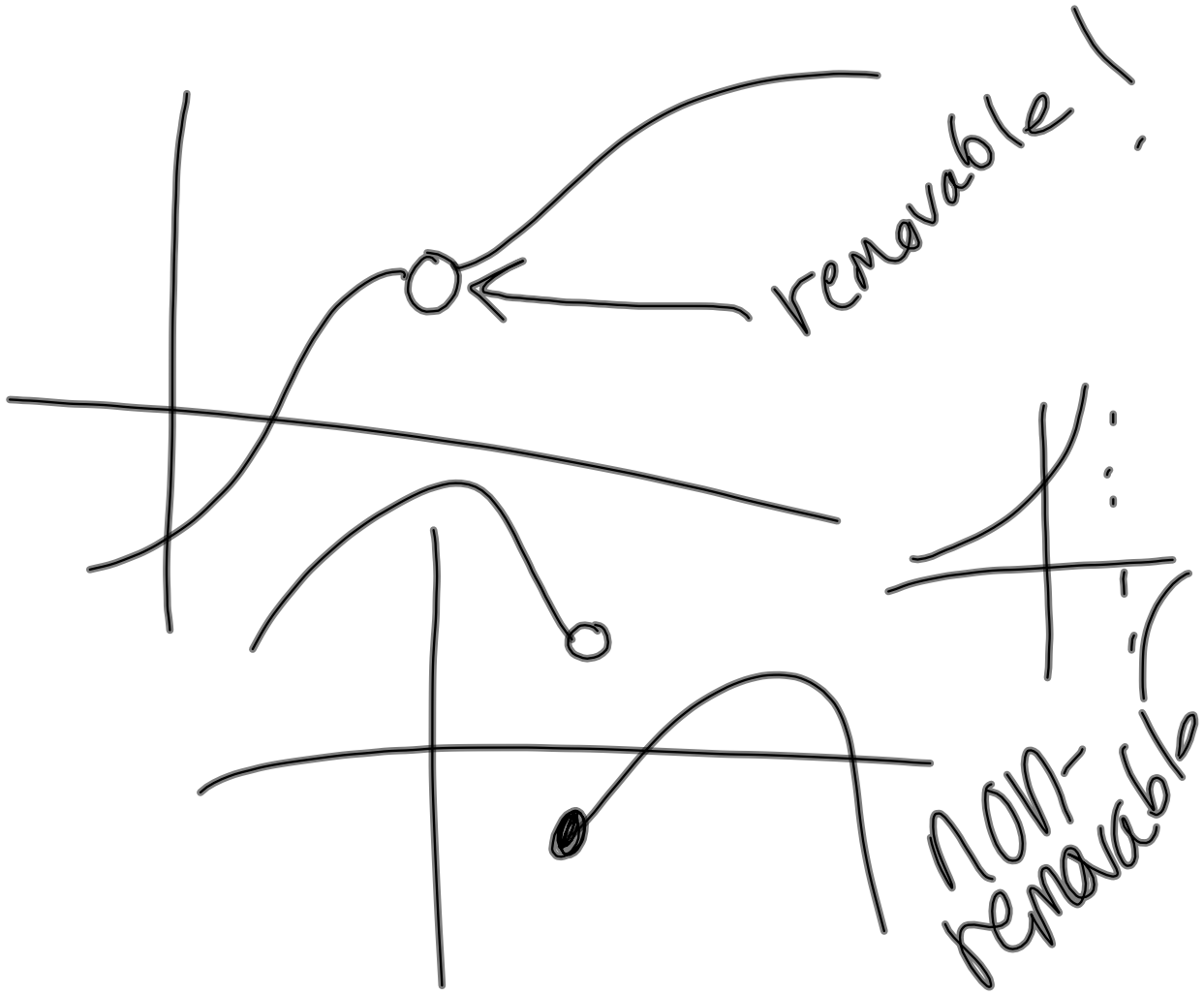
$-2^2 + 4(2) - 2 =$

$-4 + 8 - 2 = 2$

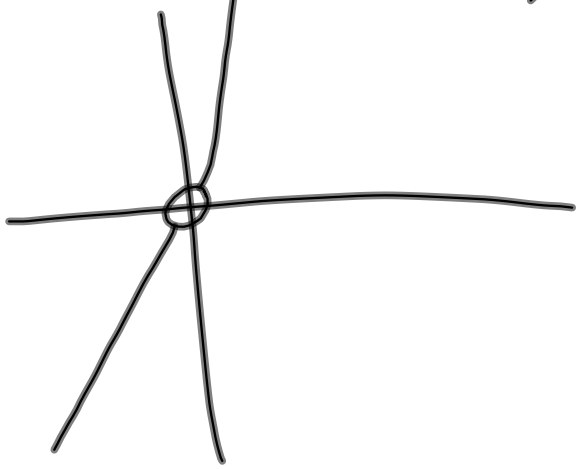


1.4 #18. $f(x) = \begin{cases} x, & x \leq 1 \\ 1 - x, & x > 1 \end{cases}$

$\lim_{x \to 1^+} f(x) =$ $1 - 1 =$ 0


removable!
non-removable

$$f(x) = \begin{cases} x & , x < 0 \\ 2x & , x > 0 \end{cases}$$



$$f(x) = \frac{(x-a)(x-b)(x-c)}{(x-a)(x-d)}$$

removable discontinuity @ $x = a$

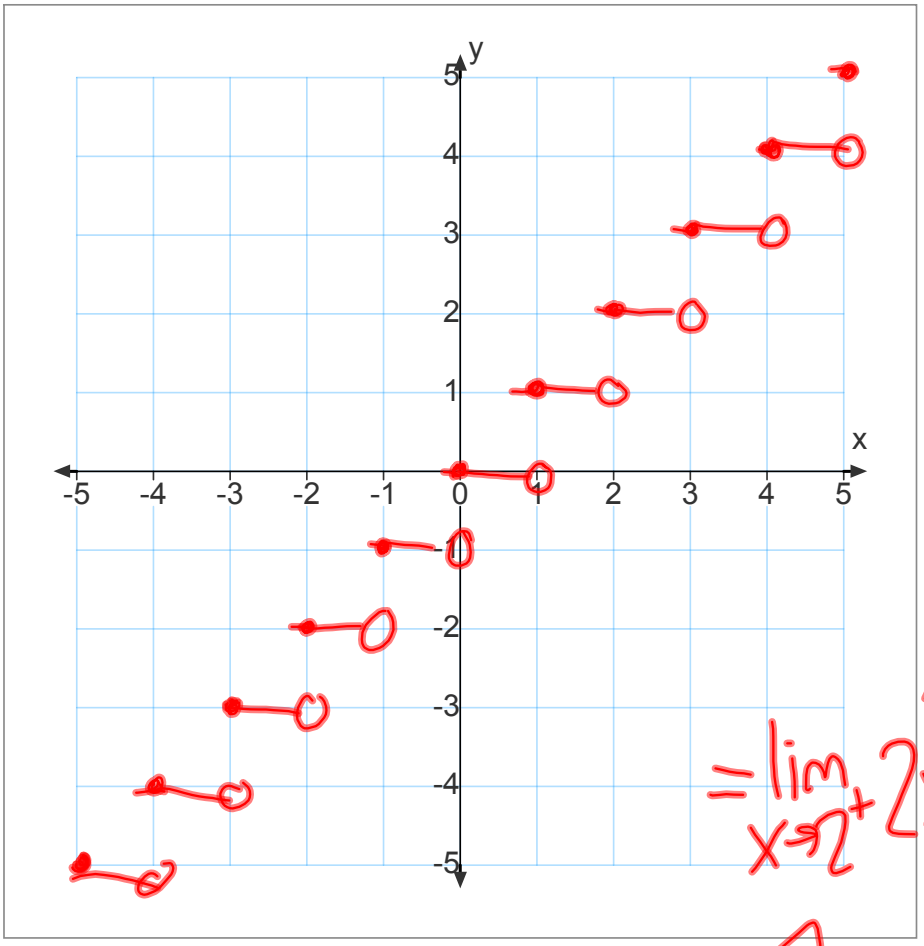
non-removable discontinuity @ $x = d$

$[\![x]\!]$ Greatest Integer Function

$f(x) = [\![x]\!]$ = the greatest integer less than or equal to x.

$[\![2]\!] = 2$ $\quad [\![-4/3]\!] = -2$

$[\![\pi]\!] = 3$



$$\lim_{x \to 0^-} [\![x]\!] = \boxed{-1}$$

22.

$$\lim_{x \to 2^+} \left(2x - [\![x]\!]\right)$$

$$= \lim_{x \to 2^+} 2x - \lim_{x \to 2^+} [\![x]\!]$$

$$= 4 - 2 = \boxed{2}$$

$[\![x]\!]$ = greatest integer $\leq x$

$$\lim_{x \to -2^-} [\![x]\!] = -3$$

24. $\lim_{x \to 1} \left(1 - \left[\left[-\frac{x}{2}\right]\right]\right)$

$[[x]]$ greatest $\mathbb{Z} \leq x$

$\left[\left[-\frac{x}{2}\right]\right]$ greatest $\mathbb{Z} \leq -\frac{x}{2}$

$\lim_{x \to 1^-} \left[\left[\frac{-x}{2}\right]\right] = -1$

$\lim_{x \to 1^+} \left[\left[\frac{-x}{2}\right]\right] = -1$

$= \lim_{x \to 1} (1) - \lim_{x \to 1} \left[\left[-\frac{x}{2}\right]\right]$

$= 1 - (-1) = \boxed{2}$

Describe the Discontinuities (& continuity!)

40. $f(x) = \frac{x-3}{x^2-9} = \frac{x-3}{(x-3)(x+3)}$

non-removable disc. @ $x = -3$

removable disc @ $x = 3$

$f(x)$ is continuous on:

$(-\infty, -3) \cup (-3, 3] \cup [3, \infty)$

Describe the [dis]continuity.

42. $f(x) = \dfrac{x-1}{(x+2)(x-1)}$

f has removable disc. @ $x = 1$

f has non-removable disc. @ $x = -2$

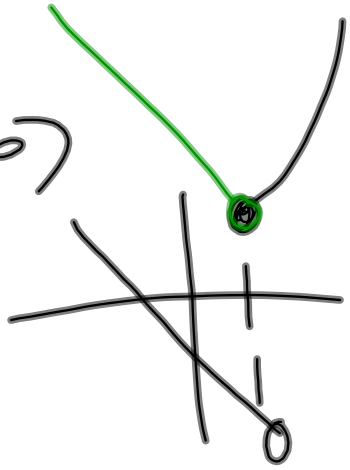
f is continuous on: $(-\infty, -2) \cup (-2, 1) \cup (1, \infty)$

44. $f(x) = \dfrac{|x-3|}{x-3}$

f has removable disc. @ none

f has non-removable disc. @ $x = 3$

f is continuous on: $(-\infty, 3) \cup (3, \infty)$



46. $f(x) = \begin{cases} -2x+3, & x < 1 \\ x^2, & x \geq 1 \end{cases}$

f has removable disc. @ none

f has non-removable disc. @ none

f is continuous on: $(-\infty, \infty)$

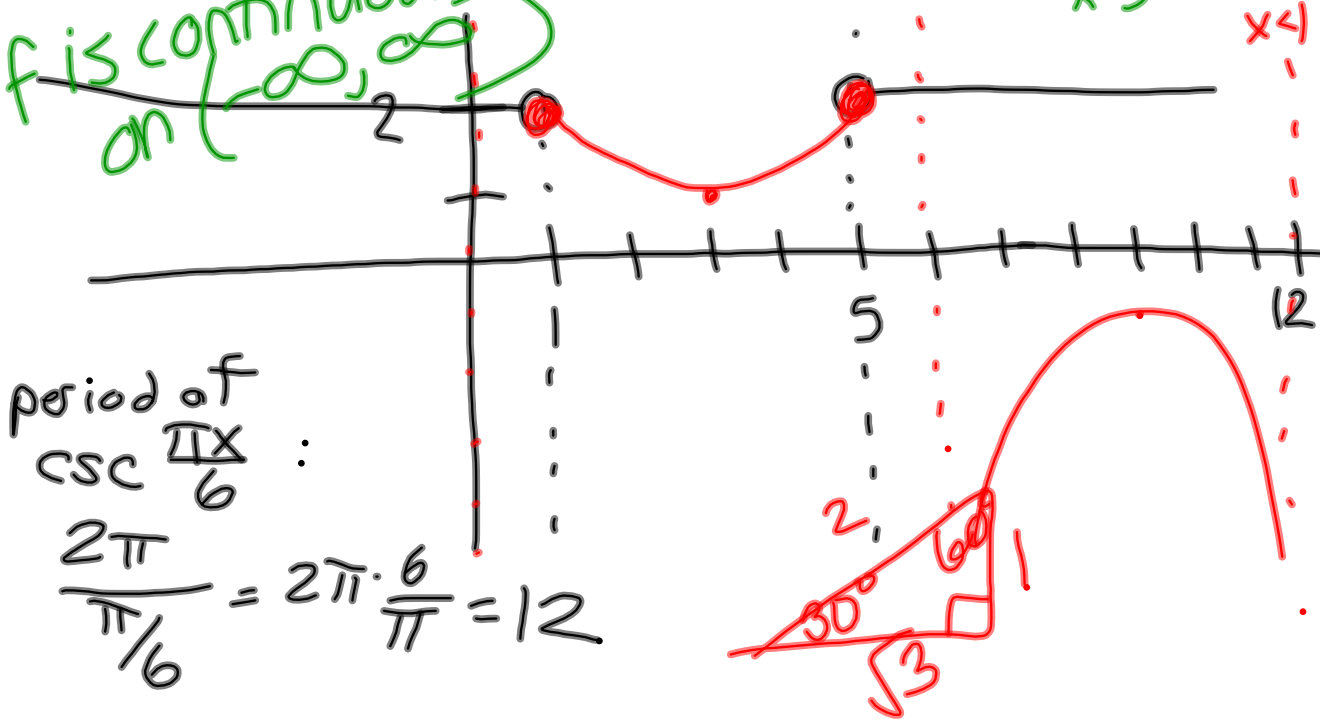
50. $f(x) = \begin{cases} \csc\frac{\pi x}{6} & , |x-3| \leq 2 \\ & , |x-3| > 2 \end{cases}$

$|x-3| \leq 2$ (less than AND): $x-3 \leq 2$ and $x-3 \geq -2$, so $x \leq 5$ and $x \geq 1$

$|x-3| > 2$ (greater OR): $x-3 > 2$ or $x-3 < -2$, so $x > 5$ or $x < 1$

no discontinuities

f is continuous on $(-\infty, \infty)$



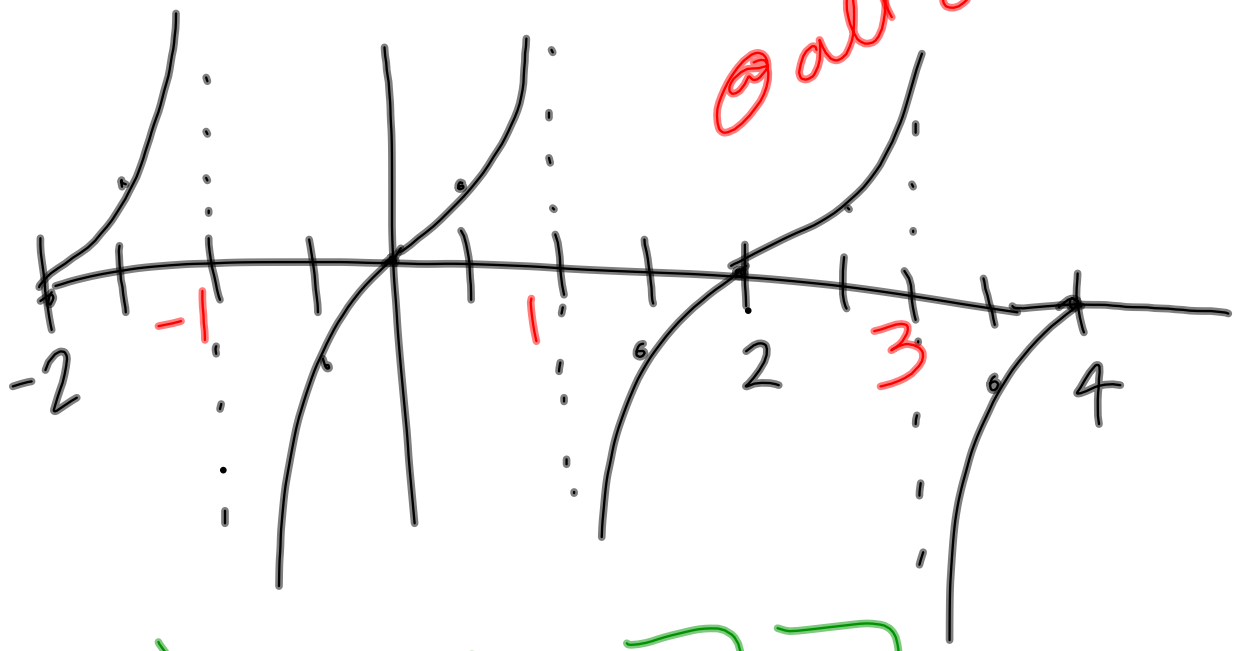
period of $\csc\frac{\pi x}{6}$:

$\frac{2\pi}{\pi/6} = 2\pi \cdot \frac{6}{\pi} = 12$

52. $f(x) = \tan\frac{\pi x}{2}$

period: $\frac{\pi}{\pi/2} = \pi \cdot \frac{2}{\pi} = 2$

f has non-removable discontinuities @ all odd integers



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