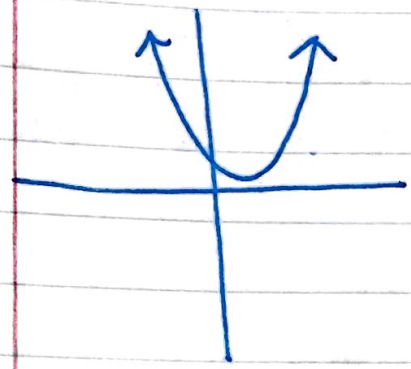
UNIT 1 DAY 1

FUNCTIONS, DOMAIN, COMPOSITION

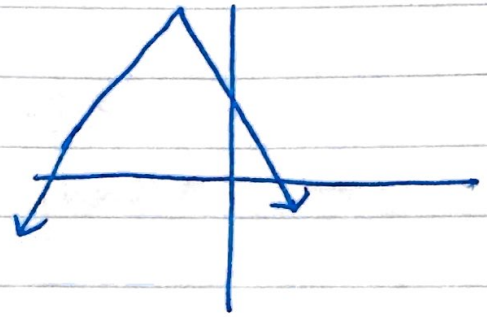


QUADRATIC

$y = ax^2 + bx + c$

Function: yes

Domain: $\{x | x = \mathbb{R}\}$

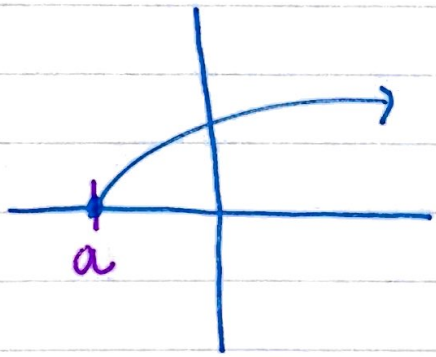


ABSOLUTE VALUE

$y = |x|$

Function: yes

Domain: $\{x | x = \mathbb{R}\}$

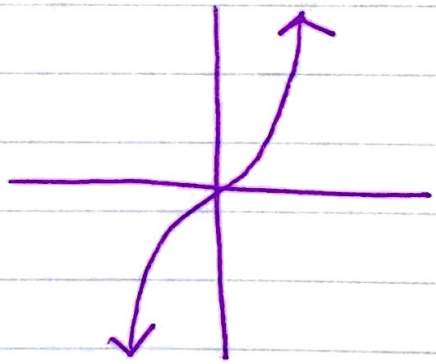


SQUARE ROOT

$y = \sqrt{x}$

Function: yes

D: $\{x | x \geq a\}$

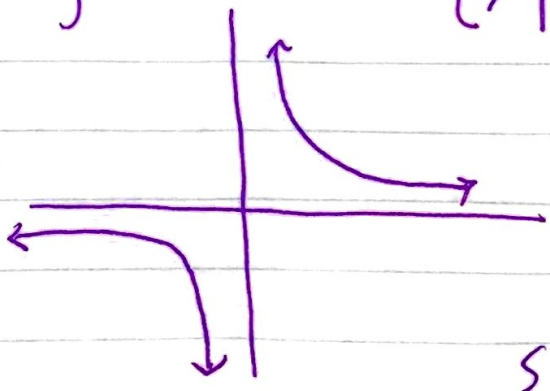


CUBIC

$y = x^3$

Function: yes

D: $\{x | x = \mathbb{R}\}$



RATIONAL

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

Function: yes

$\{x | x \neq 0\}$

DOMAIN:

① $y = x^2 + 2x - 23$ → quadratic → $D: \{x \mid x = \mathbb{R}\}$

$(-\infty, \infty)$

② $y = \sqrt{81 - 3x}$ ← square root →

$81 - 3x \geq 0$ ← want argument to be positive or $= 0$!

$-81 \quad -81$

$\frac{-3x}{-3} \geq \frac{-81}{-3}$

$D: \{x \mid x \leq 27\}$

③ $y = \frac{2}{x+3}$ ← variable in denom. → rational → what makes denom. $= 0$?

$x + 3 = 0$

$x = -3$ → rule out value that makes denom. $= 0$!

$D: \{x \mid x \neq -3\}$

④ $y = \frac{-2}{x^2 - x - 12} = 0$ ← rational → what makes denom. $= 0$

-12: $-4, 3$; -1

$(x-4)(x+3) = 0$

$x = 4, -3$

$D: \{x \mid x \neq 4, -3\}$

(5) $y = \frac{3}{\sqrt{2x+5}}$ | rational, square root | can't be 0 / can't be negative!

square root in denom. → argument > 0

$2x+5 > 0$

$2x > -5$

$\{x \mid x > \frac{-5}{2}\}$

(6) $y = \frac{4}{x^2+7}$ rational w/ quadratic

always positive!

$x^2 + 7 = 0$

$\sqrt{x^2} = \sqrt{-7}$

$x =$ nonreal

D: $\{x \mid x = \mathbb{R}\}$

Evaluate.

$f(x) = x^2 + 4 \qquad g(x) = -3x + 7$

① $f(-3) = (-3)^2 + 4 = 9 + 4 = \boxed{13}$

② $f(g(5)) = f(-3 \cdot 5 + 7) = f(-8) = (-8)^2 + 4$
$= \boxed{68}$

③ $g(f(-3)) = g(13) = -3 \cdot 13 + 7 = \boxed{-32}$

④ $f(a) = a^2 + 4$

⑤ $f(a+h)$
$= (a+h)^2 + 4$
$= (a+h)(a+h) + 4$
$= \boxed{a^2 + 2ah + h^2 + 4}$

⑥ $f(a+h) - f(a)$
$a^2 + 2ah + h^2 + 4 - (a^2 + 4)$
$a^2 + 2ah + h^2 + 4 - a^2 - 4 = \boxed{2ah + h^2}$

⑦ $\dfrac{f(x+h) - f(x)}{h}$

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

⑦ $$\frac{f(x+h) - f(x)}{h}$$

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

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

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

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