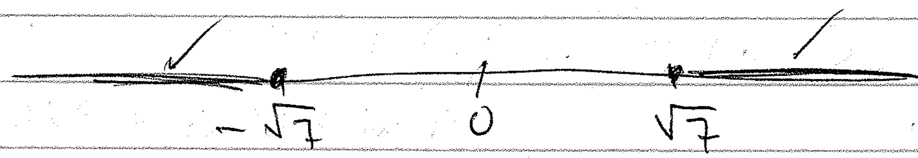
28 January — Early notes

Sec 2 Domain

$h(x) = \sqrt{x^2-7} - 4$

Dom: $x^2 - 7 \geq 0 \longrightarrow (x-\sqrt{7})(x+\sqrt{7}) \geq 0$



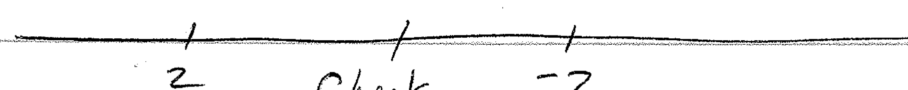
Check $x = 0$, $x^2 - 7 = 0^2 - 7 = -7 < 0$

Discard interval

$x \leq -\sqrt{7}$ or $x \geq \sqrt{7}$

Ex. 2.1 Error in book — States the domain $y = \sqrt{4-x^2}$ where $4 - x^2 \geq 0$ is $(-\infty, -2] \cup [2, \infty)$. This is incorrect.

$4 - x^2 \geq 0 \longrightarrow (2-x)(2+x) \geq 0$



Check

$x=0$

$4 - 0^2 = 4 > 0$ checks

So $[-2, 2]$ is the correct domain.

1 $C(p) = 1.25p$ Dom: $p \geq 0$ equiv. to $[0, \infty)$

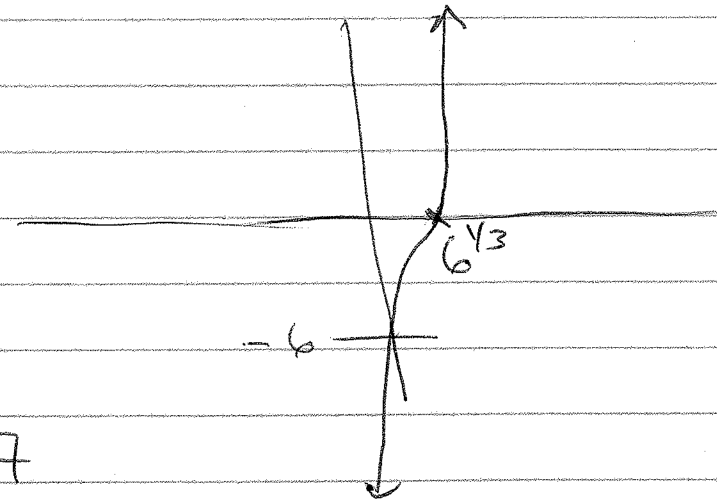
$h(x) = x^2 + 3x - 7$, $-1 < x \leq 8$ equiv. to

$(-1, 8]$ as given

Relationship btwn pts on graph and equation:

book $y = \cancel{8}x^3 - 6$

Pts on curve:



at $x = 0$, $y = -6$
at $x = 1$, $y = -5$
at $x = -1$, $y = -7$

What is the root ("zero", x-intercept, "soln")

Set $x^3 - 6 = 0 \rightarrow x^3 = 6 \rightarrow$

$\longrightarrow (x^3)^{1/3} = 6^{1/3} \longrightarrow x = 6^{1/3}$

Piecewise fcns

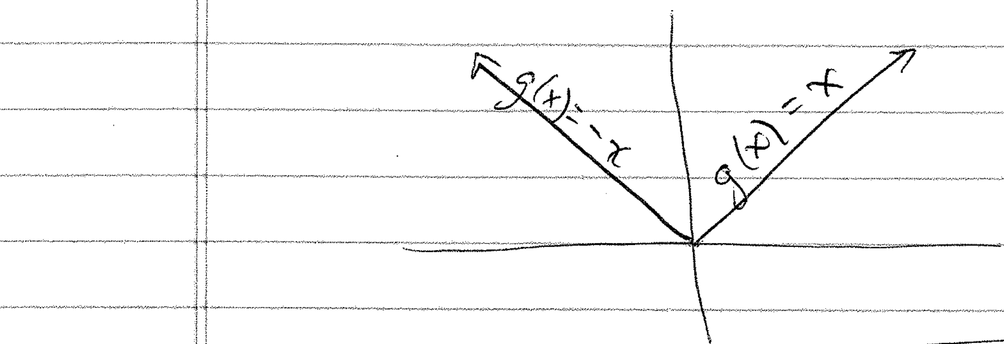
We saw a natural piecewise fcn on Monday

$$y = |x| = \begin{cases} x, & x \geq 0 \\ -x, & x < 0 \end{cases}$$

domain (x values)

range (values taken on by y)

#4 $g(x) = \begin{cases} -x, & x < 0 \\ x, & x \geq 0 \end{cases}$ The same as the abs value fcn.



Questions: $C(68) =$ $\qquad$ $C(320) =$

$T(40{,}000) =$ $\qquad$ $T(200{,}000) =$

$f(\sqrt{5}) =$ $\qquad$ $f(-5) =$

$g(-10^4) =$ $\qquad$ $g(6) =$

Back to fcn. ~~composition~~ operations and domain:

$(f/g)(x) = \dfrac{x}{(x^2+3)\sqrt{x}}$ simplifies to $\dfrac{\sqrt{x}}{x^2+3}$

But domain(f/g) excludes $x = 0$, since the unsimplified expression reveals the domain of f/g more honestly.

$(f \circ g)(x) = \dfrac{\sqrt{x}}{(\sqrt{x})^2 + 3}$ simplifies to $\dfrac{\sqrt{x}}{x+3}$

But x must be nonnegative since $\sqrt{x}$ is not defined for $x < 0$.

1/30

Domain of $y = \frac{1}{\sqrt{x}}$:

Eqn. of x + y axes:

$$P(x) = a_n x^n + a_{n-1} x^{n-1} + \dots + a_1 x^1 + a_0$$

- Polynomial of deg n. (Quadratic is deg 2, line is deg 1 or maybe 0 in case of zero poly.)

- Finding the roots of a quadratic fcn $f(x)$

Set $f(x) = 0$. Sometimes the roots are apparent, as in example $f(x) = x^2$

$\rightarrow x^2 = 0 \rightarrow x = 0$, i.e., binomial fcn

Or $f(x) = x^2 - 9 = 0 \rightarrow x^2 = 9 \rightarrow x = \pm 3$

These factor as conjugates $(x+c)(x-c)$

But for trinomials you need to factor via "reverse FOIL". If you can't then you need to complete the square or use the QF.

Linear fcns – $R(x)$, $C(x)$, $P(x)$

Book: formulates a linear eqn. $f(x) = mx + b$ into $px + qy + r = 0$, which is the general form of a line, vertical or not

Slope-int $\quad y = mx + b \quad , \quad m = 0 \rightarrow y = b$ horiz. line

But if we want to represent a vertical line we can't use $y = mx + b$

Pt-slope $\quad y - y_1 = m(x - x_1)$

This can be transformed to the general form by letting $p = m$, $q = -1$, $r = y_1 - mx_1$

This is not particularly useful, and p here is not the same as p in $R(x) = px$

So avoid this formulation of the line.

It is powerful in one sense (see scrap ☆) but not applied elsewhere here