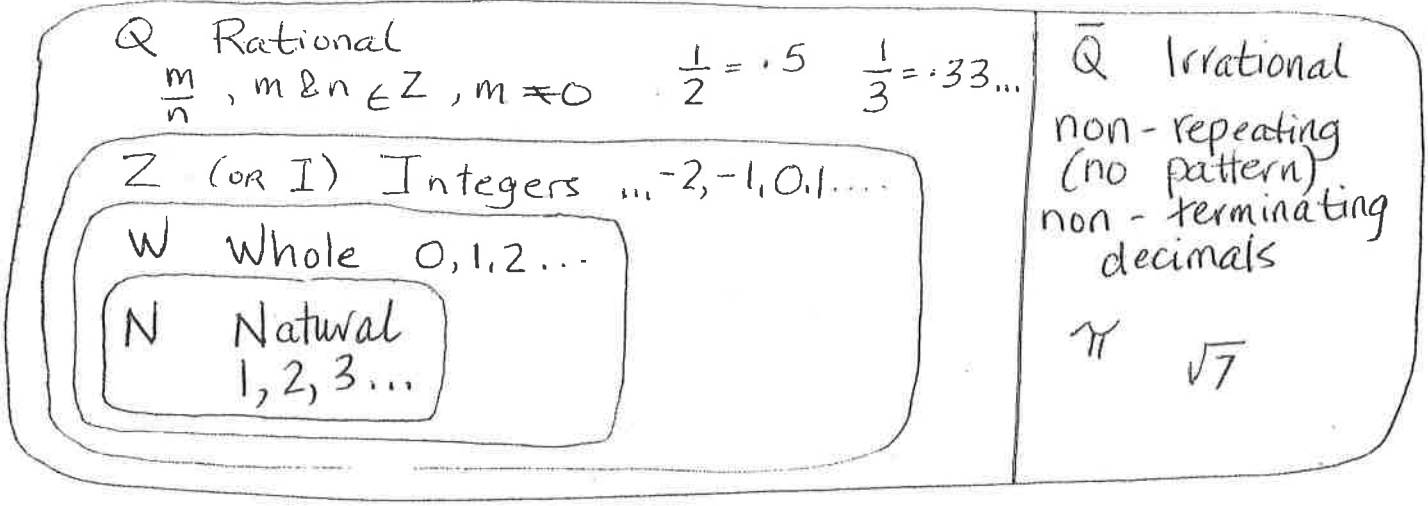
Math 10 Review - Part 1

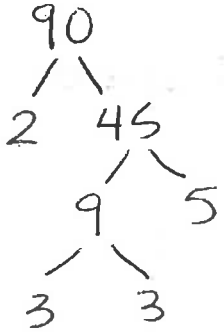
Real Numbers



1) -2.7 2) $\sqrt{72}$ 3) $4.5\dot{4}$

4) T or F All Integers are Natural, Rational & Real

Factoring & Prime Factorization



$90 = 2 \cdot 3^2 \cdot 5$

- primes in ascending order
- use exponents as needed

G.C.F Greatest Common Factor

↓

BIGGEST they share in Common

$80 = 2^4 \cdot 5$
$96 = 2^5 \cdot 3$
$160 = 2^5 \cdot 3$

GCF $2^4 = 16$

L.C.M Least Common Multiple

↳ smallest multiple you can build

$L.C.M = 2^5 \cdot 3 \cdot 5$
$= 480$

(must be able to 'see' each number in solution.)

RADICALS

index - 2 when unstated
radical sign

$\sqrt[n]{x}$ ← radicand

Perfect Squares → product of 2 equal factors
1, 4, 9, 16, 25, 36, 49, 64, 81, 100, 121, 144, 169 ...
x^2, a^4, $\frac{64}{b^6}$

Perfect Cubes → product of 3 equal factors
1, 8, 27, 64, 125, 216, 343, 512, 729, 1000, ...
x^3, a^6, $\frac{b^9}{216}$

NB: $\sqrt{-16}$ undefined

$\sqrt[3]{-27} = -3$

Using Prime Factorization to solve radicals

$\sqrt{245} = \sqrt{5 \cdot 7 \cdot 7}$
$= 7\sqrt{5}$

$\sqrt[3]{1029} = \sqrt[3]{3 \cdot 7 \cdot 7 \cdot 7}$
$= 7\sqrt[3]{3}$

Evaluating Radicals

$3\sqrt{12} \cdot 7\sqrt{15} = 3 \cdot 7\sqrt{2 \cdot 2 \cdot 3} \cdot \sqrt{3 \cdot 5}$
$= 3 \cdot 7 \cdot 2 \cdot 3\sqrt{5}$
$= 126\sqrt{5}$

$7\sqrt[3]{24} \cdot 6\sqrt[3]{45} = 7 \cdot 6 \cdot \sqrt[3]{2 \cdot 2 \cdot 2 \cdot 3} \cdot \sqrt[3]{3 \cdot 3 \cdot 5}$
$= 7 \cdot 6 \cdot 2 \cdot 3\sqrt[3]{5}$
$= 252\sqrt[3]{5}$

Entire and Mixed Radicals

$\sqrt{12} \longleftrightarrow 2\sqrt{3}$

$5\sqrt{7}$ mixed $3\sqrt[3]{7}$

$\sqrt{5 \cdot 5 \cdot 7}$ $\sqrt[3]{3 \cdot 3 \cdot 3 \cdot 7}$

$\sqrt{175}$ entire $\sqrt[3]{189}$

Restrictions on Radicals

1) When is $\sqrt{x}$ defined $\Rightarrow$ $x \geq 0$

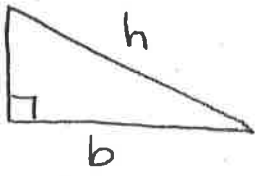
2) When is $\sqrt{3-x}$ not defined

- when $3 - x < 0$

$\therefore 3 < x$ or $x > 3$

Word Problems

- recall pythagorus



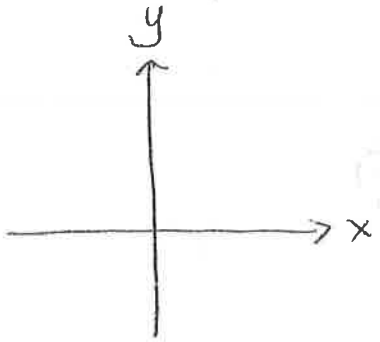
$a^2 + b^2 = h^2$

- area and surface area (sq. units)
- volume (cubed units)

Relations

ordered pairs
(domain, range)

on co-ordinate plane (x, y)



Graphing Using a Table of Values

$y = 2x - 1$

choose x →

x	y
-1	-3
0	-1
1	1
2	3

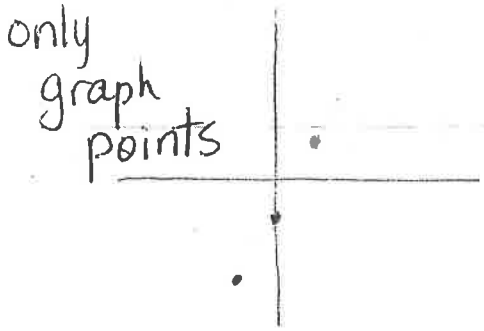
← calculate y using substitution

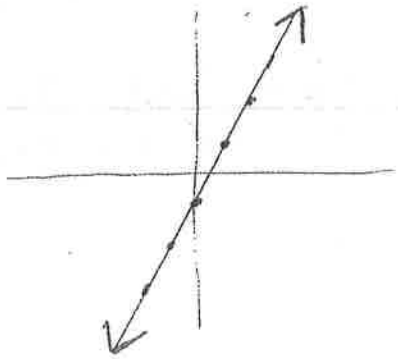
Discrete vs **Continuous Data**

$(-1, -3)$
$(0, -1)$
$(1, 1)$

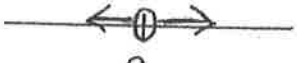
→ no restriction on choice of x; we graph a portion of relation; use arrows

only graph points



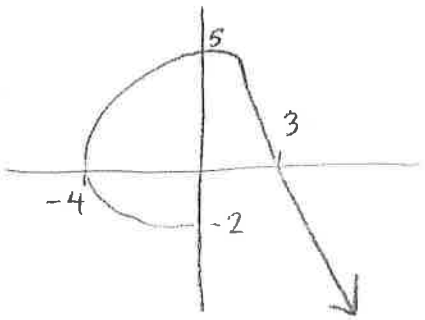


Expressing Domain & Range

Numberline	Interval Notation	Inequalities & Set Notation
 $x > 2$	lower limit , upper limit	$\{x \mid x > 2, x \in \mathbb{R}\}$
 $x \leq -4$	choose bracket	$\{x \mid x = 2,3, x \in N\}$
 $-6 \leq x < -2$	[include limit (exclude limit	$\{y \mid y \in \mathbb{R}\}$
 $x \neq 9$		

Equivalent Statements

$x \leq 4$ $(\infty, 4]$ $\{x \mid x \leq 4, x \in \mathbb{R}\}$



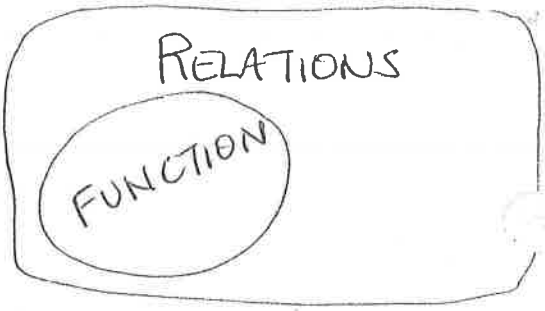
D: 

$[-4, \infty)$ $\{x \mid x \geq -4, x \in \mathbb{R}\}$

R: 

$(\infty, 5]$ $\{y \mid y \leq 5, y \in \mathbb{R}\}$

Functions
→ special class of Relation
1 valid output for each valid input



x	y
1	3
2	4
2	5

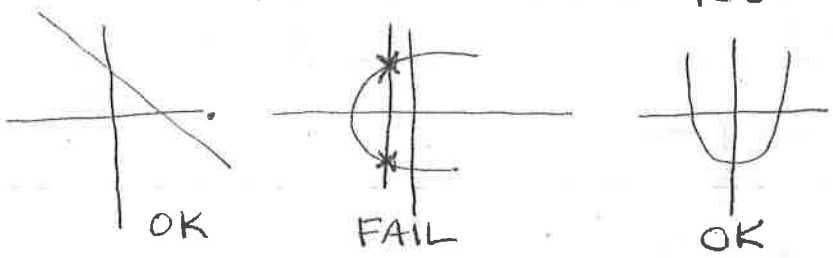
result for 2 can not be 2 different values

x	y
1	2
2	2
3	2

OK.

GRAPHICALLY ...

Vertical Line Test



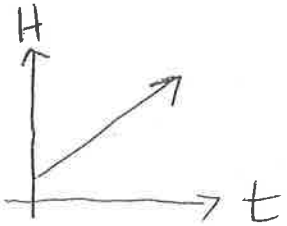
Function Notation
↳ only use with functions

$y = 2x - 1$

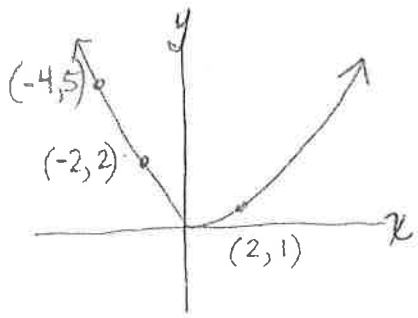
$f(x) = 2x - 1$

$f(-3) = 2(-3) - 1$
$= -7$

$f(x) = 7$
$7 = 2x - 1$
$8 = 2x$
$4 = x$



$H(t) = \frac{1}{2}t + 1$

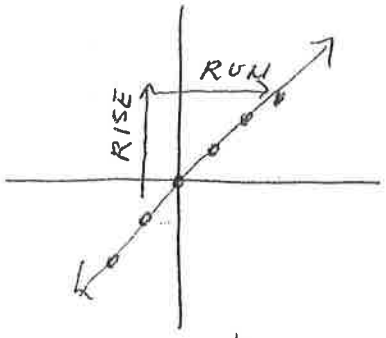


$f(2) = 1$

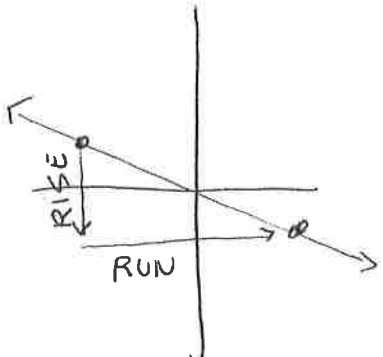
Find x if $f(x) = 5$ _____

Find $f(-2)$ _____

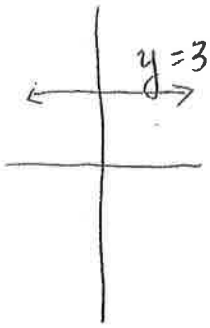
CHARACTERISTICS of LINES



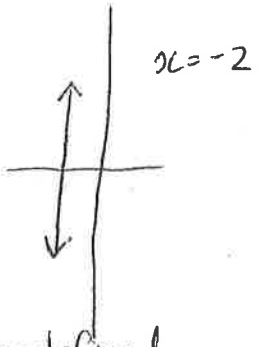
+ve slope



-ve slope



zero slope



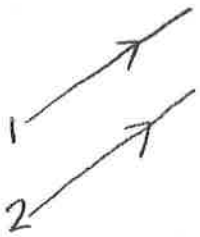
undefined slope

$m = \frac{\text{rise}}{\text{run}}$ OR $\frac{\Delta y}{\Delta x}$ OR $\frac{y_2 - y_1}{x_2 - x_1}$ from pt (x_1, y_1) & pt (x_2, y_2)

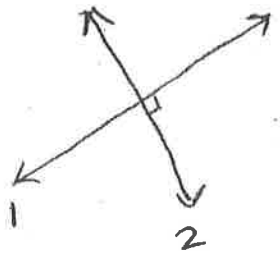
↓

slope ⇒ steepness of line

- if viewable from both sides ... roof — no + or −
  ... ladder mentioned

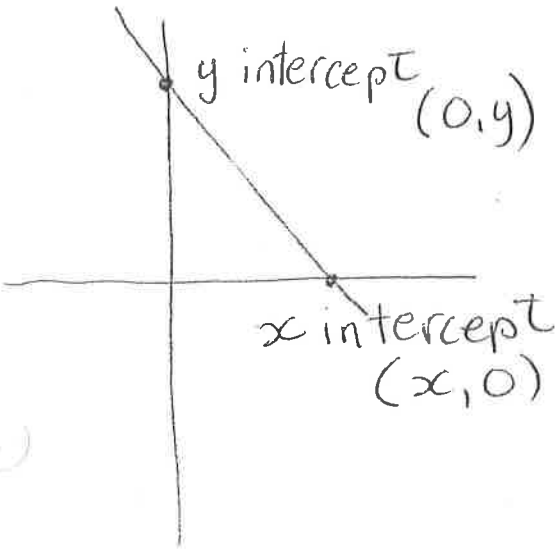


$m_1 = m_2$



$m_1 \cdot m_2 = -1$

slopes are negative reciprocals



Since y-intercept occurs when $x=0$; to find set $x=0$

Since x-intercept occurs when $y=0$; to find set $y=0$

LINEAR EQUATIONS (straight lines)

GRAPHING

- T.O.V
- slope intercept form
- x & y intercepts

slope → m, y-intercept → b

$y = mx + b$

$y = 0$ ↓ $x = 0$

EQUATIONS

⇒ all 'first degree' (exponent = 1)

3 FORMS OR HORIZONTAL OR VERTICAL

1) SLOPE - INTERCEPT
$y = mx + b$

$y = 2$

$y - 2 = 0$ (General Form)

$x = -3$

$x + 3 = 0$

2) POINT - SLOPE
$y - y_1 = m(x - x_1)$

3) GENERAL FORM
$Ax + By + C = 0$

$A, B, C \in Z$,

$A > 0$

Math 10 Review- Part 2

Exponents

power ← e ← exponent

a^0

↑

base

$a^0 = 1$

* any number to the power of 0 equals 1

$a^{-\frac{1}{2}} = \frac{1}{a^{\frac{1}{2}}}$

* to make an exponent positive put the entire power under 1.

$m^5 \times m^3 = m^{5+3} = m^8$

* when multiplying bases that are the same you add the exponents

$m^6 \div m^2 = m^{6-2} = m^4$

* when dividing bases that are the same you subtract the exponents

$(m^3)^4 = m^{3\times4} = m^{12}$

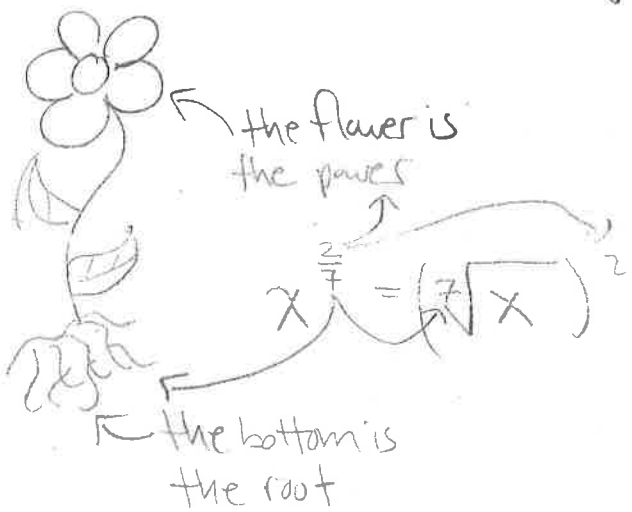
* one base and two exponents, multiply the exponents together.

$(2m^2)^3 = 2^{1\times3} \cdot m^{2\times3} = 2^3 m^6 = 8m^6$

* all bases in brackets are raised to the exponent outside the bracket.

ex. $\left(\frac{2}{x^2}\right)^3 = \frac{2^3}{x^{2\times3}} = \frac{8}{x^6}$

Flower Power: $x^{\frac{2}{3}} = \sqrt[3]{x^2}$



ex. $\left[\left(\frac{2m^2n^2}{mn^3}\right)^{-1}\right]^3$

$= \left[\left(\frac{2m^{2-1}}{n^{3-2}}\right)^{-1}\right]^3$

$= \left[\left(\frac{2m}{n}\right)^{-1}\right]^3$

$= \left(\frac{2^{-1}m^{-1}}{n^{-1}}\right)^3$

$= \left(\frac{2^{-1}}{1} \cdot \frac{m^{-1}}{1} \cdot \frac{1}{n^{-1}}\right)^3$

$= \left(\frac{1}{2} \cdot \frac{1}{m} \cdot \frac{n}{1}\right)^3$

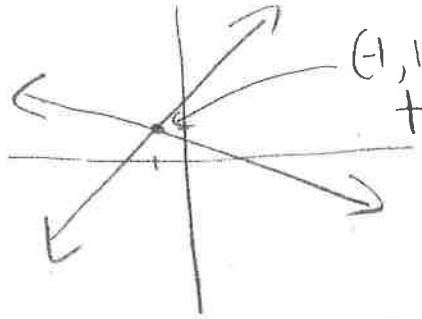
$= \left(\frac{n}{2m}\right)^3$

$= \frac{n^3}{2^3m^3}$

$= \frac{n^3}{8m^3}$

Systems of Linear Equations

* The solution to a system of equations is any point that is on both lines.

ex  $(-1,1)$ is the solution to this system

* To check if a point is a solution to a system, substitute the point into both equations and see if the equations stay true.

ex. Is $(2,3)$ a solution to the system $2y = x + 4$ and $y - x = 1$.

Solution: $2(3) = 2+4$ ✓ $\quad 6 = 6$

$3 - 2 = 1$ ✓ $\quad 1 = 1$

Yes, $(2,3)$ is a solution to the system.

* You can solve a system graphically or algebraically.

→ To solve graphically, graph both lines and see if they cross

→ To solve algebraically use substitution or Elimination

Substitution

Solve: $a + c = 9$, $2a + c = 11$

$a = 9 - c$

$2(9-c) + c = 11$

$18 - 2c + c = 11$

$18 - c = 11$

$18 - 11 = c$ $\quad \boxed{c = 7}$

$a = 9 - c$

$a = 9 - 7$

$\boxed{a = 2}$

Elimination

Solve: $a + c = 9$, $2a + c = 11$ $\quad \times -2$

$-2a - 2c = -18$

$+ \; 2a + c = 11$

$-c = -7$

$\boxed{c = 7}$

$a + (7) = 9$ $\quad \boxed{a = 2}$

$a = 9 - 7 = 2$

Systems of Linear Equations Continued.

Types of Solution Sets:

One Solution
- Lines intersect once
- Different slopes

we say the system is: **Consistent**

No Solutions
- Parallel Lines
- Same slopes
- different y-intercepts

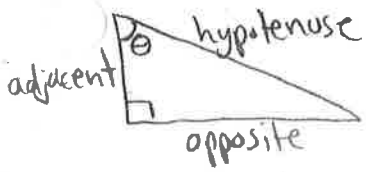
we say the system is: **Inconsistent** (no solution)

Infinite Solutions
- Same lines
- Same slopes
- Same y-intercepts

We say the system is: **Consistent**

• Material Below this line is NOT on Midterm

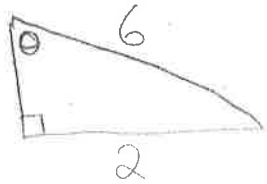
Trigonometry



Soh Cah Toa

$\sin\theta = \frac{opp}{hyp}$ $\cos\theta = \frac{adj}{hyp}$ $\tan\theta = \frac{opp}{adj}$

ex/ Find the exact Sine ratio.



$\sin\theta = \frac{opp}{hyp} = \frac{2}{6} = \boxed{\frac{1}{3}}$

ex/ Find θ.

$\tan\theta = \frac{adj}{opp} = \frac{4}{3}$

$\tan\theta = \frac{4}{3}$

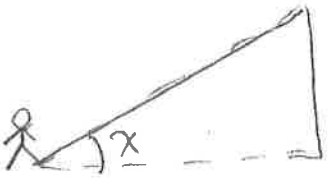
$\theta = \tan^{-1}\left(\frac{4}{3}\right)$

$\theta = 53°$

Trigonometry Continued

Angle of depression:

Angle of elevation:



Measurement

How to convert units:

* be sure your units cancel!

ex. Convert 2.2 miles to meters.

$$2.2 \text{ miles} \times \frac{5280 \text{ feet}}{1 \text{ mile}} \times \frac{0.3048 \text{ meters}}{1 \text{ foot}} = 3540.56 \text{ meters}$$

⇒ know how to use SA and V formula's

⇒ Know how to read a Vernier Caliper

⇒ Know what a Trundle Wheel, Micrometer, Clinometer and Caliper measure.