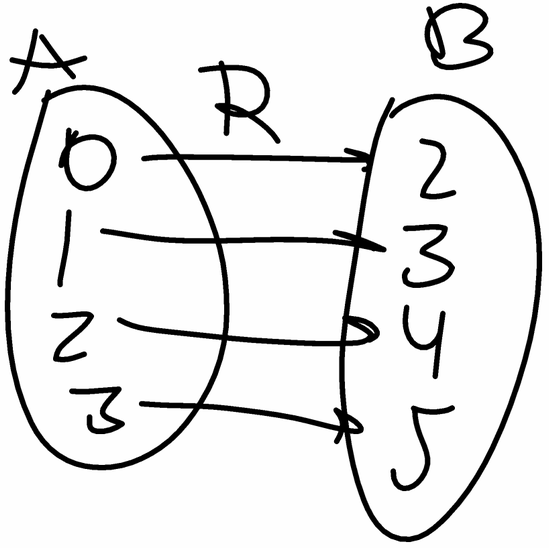
# G11 F&A REVIEW 2

Q1: Write the set of fig

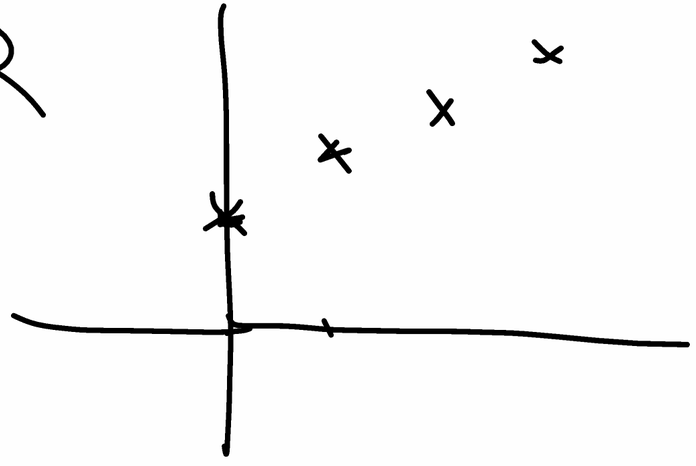

$A = \{2, 3, 5\}$

Q2 Write the expression of relation R:




$R = \{(0,2), (1,3), (2,4), (3,5)\}$

Q3: Graph relation R



Q4: State Domain & Range of R

$Range(R) = \{2, 3, 4, 5\}$

$Dom(R) = \{0, 1, 2, 3\}$

**Q5**: Solve $3x^2 - 12x + 12 = 0$

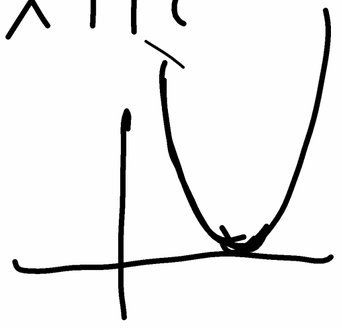
$ax^2 + bx + c = 0$

$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$x = \frac{12 \pm \sqrt{12^2 - 4 \cdot 3 \cdot 12}}{2 \cdot 3} = \frac{12 \pm \sqrt{144 - 144}}{6} =$

$= \frac{12}{6} = 2$

**Q6.-** How many zeros does $f(x) = 3x^2 - 12x + 12$ has? Find them. $f(x) = 0$ $x = 2$



∴ **Q7**: Sketch f(x)

Q5: Write a quadratic function in

a) standard form $f(x) = 7x^2 - 5x + 3$

b) vertex form $g(x) = \frac{1}{2}(x+7)^2 - 2$

c) Factor form $h(x) = 3(x-1)(x+2)$

Q6:- Write $f(x)$ in vertex form

# Q6: Write $f(x) = 7x^2 - 5x + 3$ in vertex form

Sol:

$(x+a)^2 = x^2 + 2ax + a^2$

$= (x+a)(x+a) = x^2 + ax + ax + a^2$

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

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

$f(x) = 7x^2 - 5x + 3 =$

$= 7\left[x^2 - \frac{5}{7}x + \frac{3}{7}\right]$ (step 1)

$= 7\left[(x-a)^2 - a^2 + \frac{3}{7}\right]$ (step 2)

(step 3) $2a = \frac{5}{7} \rightarrow a = \frac{5}{2 \cdot 7} = \frac{5}{14}$

(step 4) $= 7\left[\left(x - \frac{5}{14}\right)^2 - \frac{5^2}{14^2} + \frac{3}{7}\right] =$

$$= 7\left[\left(x-\frac{5}{14}\right)^2 - \frac{5^2}{14^2} + \frac{3}{7}\right] =$$

$$= 7\left(x-\frac{5}{14}\right)^2 - 7\cdot\frac{5^2}{14^2} + \cancel{7}\cdot\frac{3}{\cancel{7}} = 7\left(x-\frac{5}{14}\right)^2 - \frac{25}{28} + 3 =$$

$$\frac{7\cdot 5^2}{14^2} = \frac{7\cdot 25}{14\cdot 14} =$$

$$= \frac{\cancel{7}\cdot 25}{\cancel{7}\cdot 2\cdot 14} = \frac{25}{28}$$

$$= 7\left(x-\frac{5}{14}\right)^2 + \frac{59}{28}$$

Vertex form of $f(x)$

$$-\frac{25}{28} + 3 = \frac{-15}{28} + \frac{84}{28} = \frac{59}{28}$$

**Q7** $g(x) = \frac{1}{2}(x+7)^2 - 2$ Write it in standard form

**Sol:** Expand the square: $(x+7)^2 = (x+7)(x+7) =$

$= x^2 + 7x + 7x + 49 = x^2 + 14x + 49$

Hence $\boxed{g(x) = \frac{1}{2}(x^2 + 14x + 49) - 2 =}$

$= \frac{x^2}{2} + 7x + \frac{49}{2} - 2 = \boxed{\frac{x^2}{2} + 7x + \frac{45}{2}}$ Standard form

$\frac{49}{2} - 2 = \frac{49}{2} - \frac{2 \cdot 2}{2}$

$= \frac{45}{2}$

**Q8.** $h(x) = 3(x-1)(x+2)$ Write in Standard form

Sol: We expand the product: $(x-1)(x+2) = x^2+2x-x-2 =$

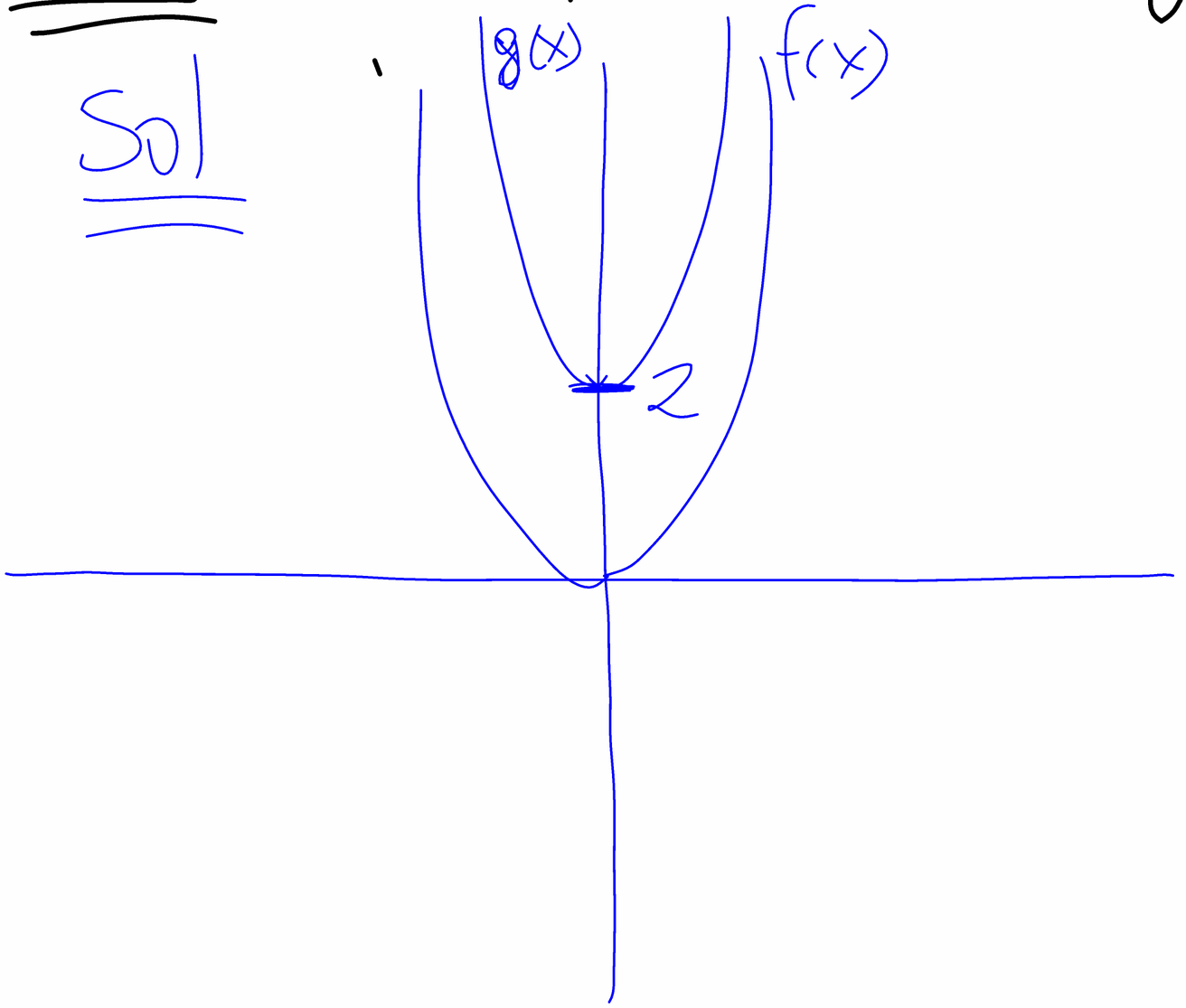
$= x^2+x-2$

Hence, $h(x) = 3(x^2+x-2) =$

$= 3x^2+3x-6$ Standard form

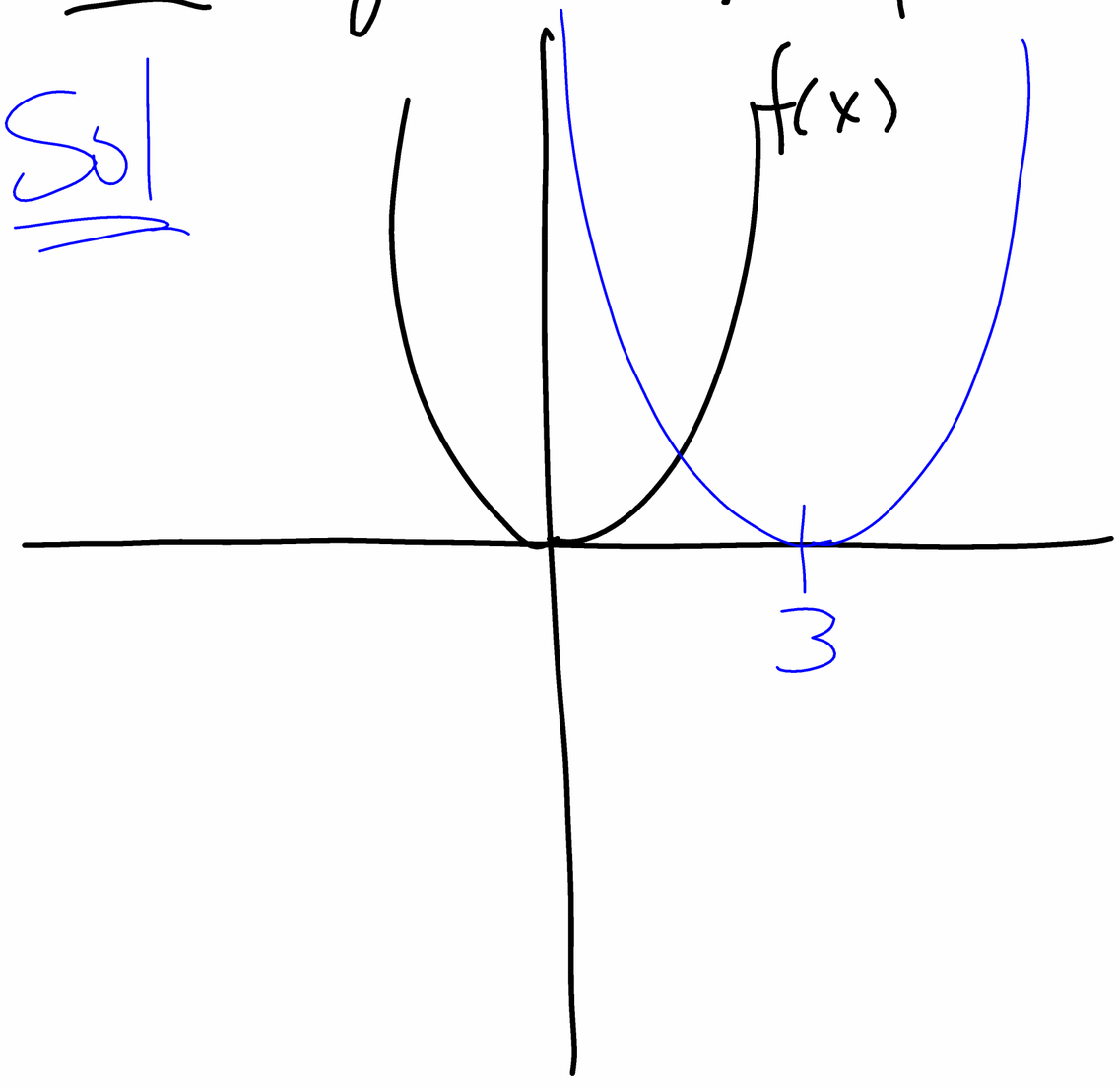
Q9: Sketch $f(x)=x^2$ & $g(x)=x^2+2$

Sol



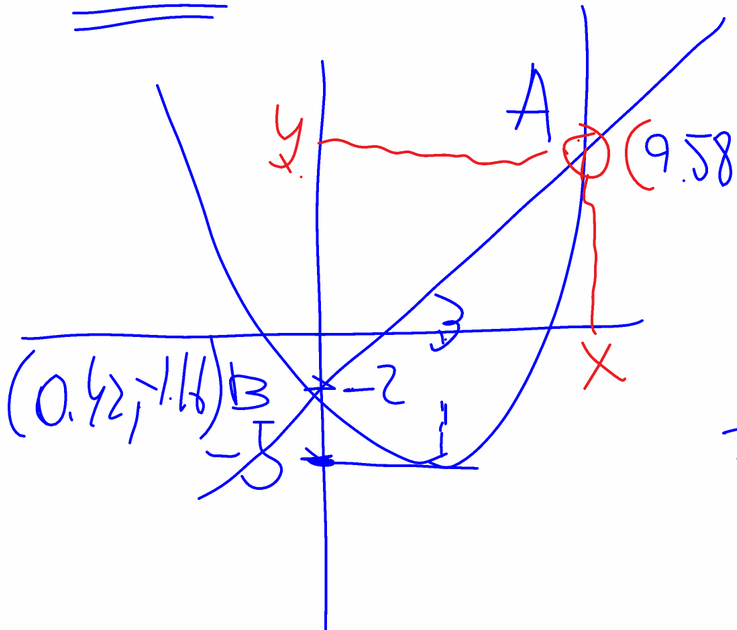
Q10: Given the plot of $f(x) = x^2$, sketch $g(x) = (x-3)^2$

Sol



**Q11**: Determine how many points of intersection there are between the parabola $y=\frac{1}{2}(x-3)^2-5$ and the line $y=2x-2$. Find the intersection points.

**Sol**




At the x where they intersect it is

$$\frac{1}{2}(x-3)^2-5=2x-2$$

Expand

$$\frac{1}{2}\left[x^2-2\cdot 3\cdot x+3^2\right]-5=2x-2$$

$$\frac{1}{2}\left[x^2-6x+9\right]-5=2x-2$$

$$\frac{x^2}{2}-3x+\frac{9}{2}-5=2x-2$$

$$\frac{x^2}{2}-3x-2x+\frac{9}{2}-5+2=0$$

$ax^2+bx+c=0$

$x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$

$$\frac{x^2}{2}-5x+\frac{3}{2}=0 \qquad a=\frac{1}{2}\quad b=-5\quad c=\frac{3}{2}$$

$$\frac{9}{2}-5+2=\frac{9-10+4}{2}=\frac{3}{2}$$

$$x=\frac{5\pm\sqrt{5^2-4\cdot\frac{1}{2}\cdot\frac{3}{2}}}{2\cdot\frac{1}{2}}=5\pm\sqrt{25-3}=5\pm\sqrt{21}=\begin{matrix}+\\-\end{matrix}\begin{matrix}9.58\\0.42\end{matrix}$$

The y-coordinates of the intersection points can be obtained by substituting these x-values in the equation of the line

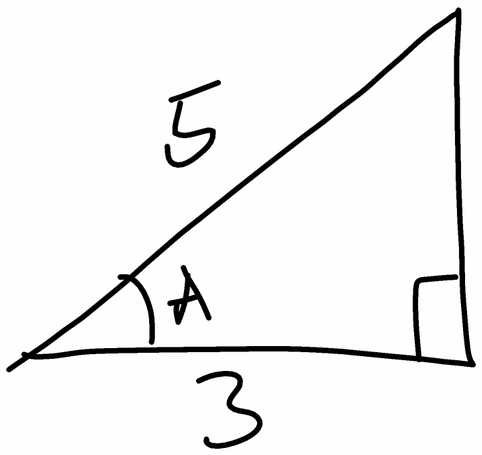
A: $y = 2 \cdot 9.58 - 2 = 17.16$

$$\boxed{A = (9.58, 17.16)}$$

B: $y = 2 \cdot 0.42 - 2 = -1.16$

$$\boxed{B = (0.42, -1,16)}$$

**Q12:**




Determine the basic trigonometric ratios for A

**Sol** We have to determine the values of $\sin A$, $\cos A$ & $\tan A$

$$\cos A = \frac{3}{5}$$

$$\tan A = \frac{\sin A}{\cos A} = \frac{4/5}{3/5} = \frac{4}{3}$$

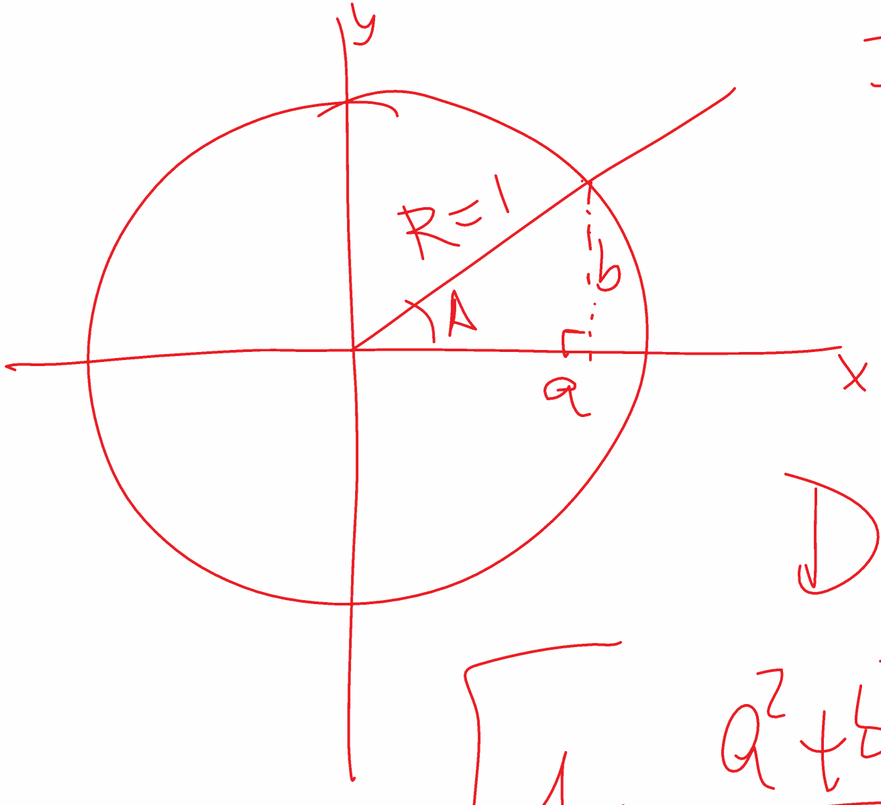
Fundamental Trigonometric Relation

$$\sin^2 A + \cos^2 A = 1$$

$$\sin^2 A + \left(\frac{3}{5}\right)^2 = 1 \rightarrow \sin A = \sqrt{1 - \frac{9}{25}}$$

$$\sin A = \sqrt{\frac{16}{25}} = \frac{4}{5}$$

# Fund. Trigono. Relation



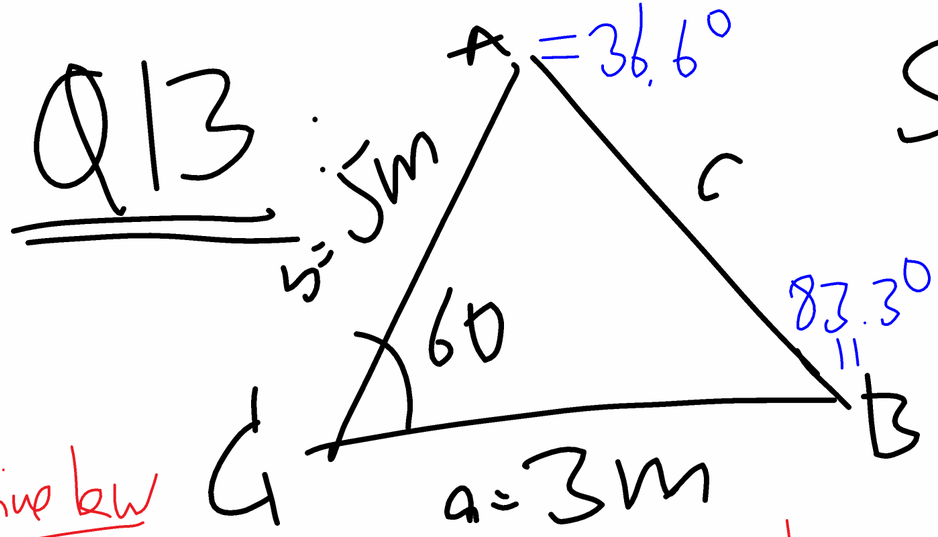

Pythagoras Theorem

$$R^2 = a^2 + b^2$$

Dinde both sides by $R^2$

$$1 = \frac{a^2+b^2}{R^2} = \frac{a^2}{R^2} + \frac{b^2}{R^2} = \left(\frac{a}{R}\right)^2 + \left(\frac{b}{R}\right)^2 = \cos^2 A + \sin^2 A$$

# Q13




Solve SAS ⇒ cosine law

Cosine law

$$c^2 = a^2 + b^2 - 2ab\cos C$$

$$c^2 = 9 + 25 - 30\cdot\frac{1}{2} = 9 + 25 - 15$$

$$c^2 = 19 \Rightarrow \boxed{c = \sqrt{19} \simeq 4.36\ m}$$

Sine law

$$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$$

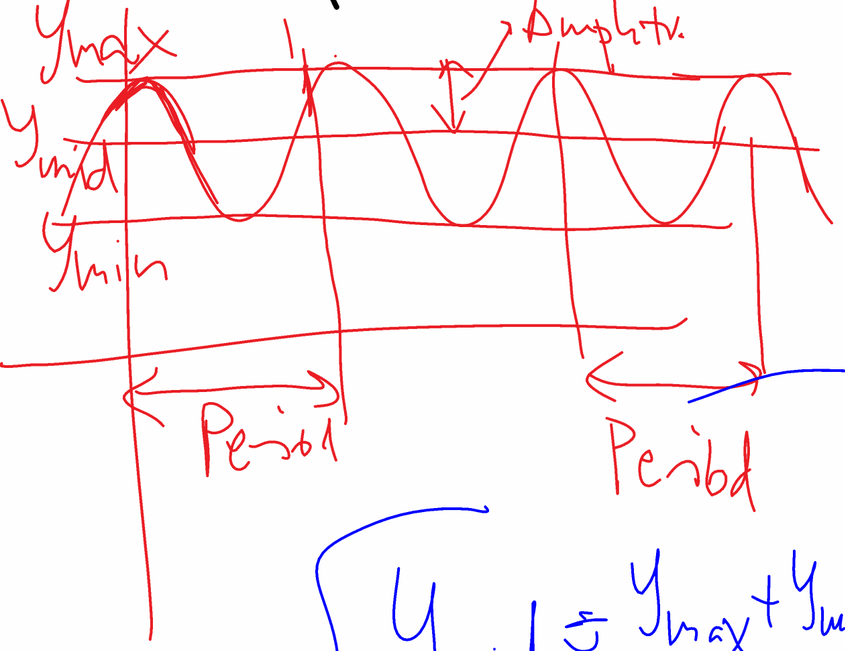
$$\frac{\sin A}{a} = \frac{\sin C}{c} \rightarrow \frac{\sin A}{3} = \frac{\sin 60}{4.36} \rightarrow \sin A = \frac{3\sin 60}{4.36} \simeq 0.5959$$

$$\boxed{A \simeq 36.6^\circ}$$

$$\frac{\sin B}{5} = \frac{\sin 60}{4.36} \rightarrow \sin B = \frac{5\sin 60}{4.36} \Rightarrow \boxed{B \simeq 83.3^\circ}$$

**Q14** Determine max. value, min value, mid-point axis, and the period of the following sinusoidal function

$$f(x) = -3\cos(2x) + 7$$




**Sol**

$$y_{min} = -3 \cdot 1 + 7 = 4$$

$$y_{max} = -3(-1) + 7 = 10$$

$$y_{mid} = \frac{y_{max} + y_{min}}{2} = 7$$

$$\text{Amplitude} = \frac{y_{max} - y_{min}}{2} = 3$$

Period:

$2x = 360$

$\rightarrow P = 180$

**Q15** A radioactive material has a half-life of 130 days. What's the percentage of material remaining after 2 yrs?

$t_{1/2} = 130$ days

**Sol:**

$2\text{ yrs} = 2 \cdot 365 \text{ days} = 730 \text{ days}$

Decay formula

$$A(t) = 100\left(\frac{1}{2}\right)^{\frac{t}{t_{1/2}}}$$

$t_{1/2} =$ "half-life"

$$A(730) = 100\left(\frac{1}{2}\right)^{\frac{730}{130}} = 100\left(\frac{1}{2}\right)^{\frac{73}{13}} \cong 100 \cdot 0.02$$

$$\boxed{A(730) \simeq 2\%}$$

**Q16:** The bank gives you a loan of $30.000 at an annual interest of 4.5%/a compounded semi-annually. If you pay back in full after 5 yrs, how much do you pay?

**Sol:** $n = 5\,\text{yrs} \cdot \frac{2\,\text{periods}}{\text{yr}} = 10$

$i = 4.5\% \cdot \frac{1\,\text{yr}}{1\,\text{yr}} \cdot \frac{1\,\text{yr}}{2\,\text{periods}} = 2.25\% \cdot \frac{}{\text{period}} = 0.0225$

$P = 30000$

Hence, $\boxed{A(10) = 30000\,(1+0.0225)^{10} \simeq}$

$\simeq 30000 \cdot 1.2492 = \underline{37476.10\$}$

$A(n) = P(1+i)^n$

$A \equiv$ Amount

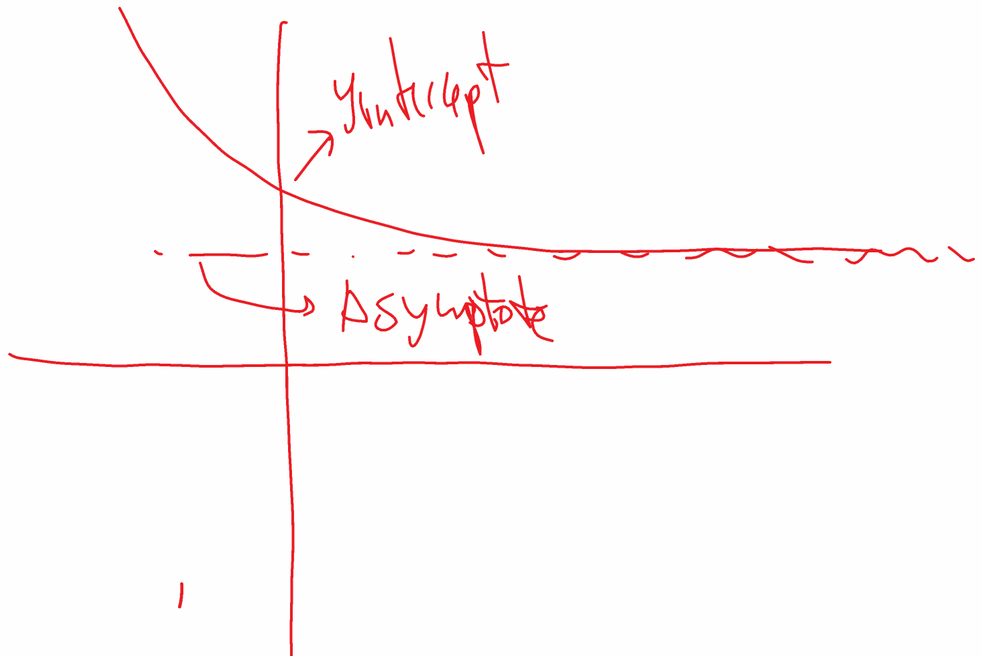
$i \equiv$ interest in one period

$n \equiv$ number of Compounding Periods

$P \equiv$ principal, aka, initial amount

Q18: Determine the horizontal asymptote & the y-intercept of the function $f(x) = 3\left(\frac{1}{2}\right)^{\frac{t}{5}} - 1$

Exponential function




Sol: $y\text{-intercept} = f(0) = 3\left(\frac{1}{2}\right)^{0} - 1 = 2$

$y_{asymp} = -1$