Qn $y = (x-1)(x+2)$ sketch the curve.
$= x^2+x-2$

step (1) put $x=0 \Rightarrow y=-2$
$\Rightarrow$ curve intersect at $y=-2$

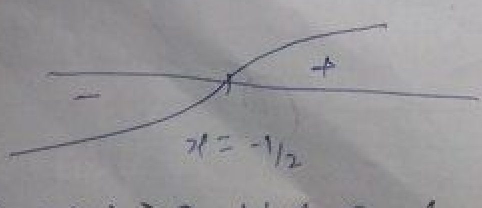
put $y=0 \Rightarrow x=1,-2 \Rightarrow$ curve intersect x-axes at $x=1,-2$

step (2) (3) find $f'(x)$ & $f''(x)$ & critical pt
$f'(x) = 2x+1$ $\quad f''(x) = 2 > 0$

$f'(x) = 0 \Rightarrow x = -1/2$ critical pt

step(4) find the interval in which fn is increasing and ~~decre~~ decreasing

$f'(x) = 2x+1 = g(x)$
$g(x) = 2x+1 = 0 \Rightarrow x = -1/2$
check the behave of $g(x)$



$\Rightarrow g(x) > 0 \;\forall x \in (-1/2, \infty)$

$\Rightarrow f(x)$ is increasing on $x \in (-\frac{1}{2}, \infty)$

$\because g(x) = f'(x) > 0 \quad \forall x \in (-1/2, \infty)$

$\Rightarrow g(x) < 0 \quad \forall x \in (-1/2, \infty)$

$\because f'(x) = g(x) < 0 \quad \forall x \in (-1/2, \infty) \Rightarrow f(x)$ is decreasing $\forall x \in (-1/2, \infty)$

Step (5) Identify any point of inflection

$\because f''(x) = 2 \neq 0 > 0 \Rightarrow$ no point of inflection

Step (6) find the interval on which the f^n concave up or concave down

$\because f''(x) = 2 > 0 \Rightarrow f^n$ is concave up $\forall x$

Step (7) find the maximum and minimum value of the f^n if exist

$\because f'(x) = 2x + 1 = 0 \quad x = -1/2$

$f''(x) = 2 > 0 \qquad f''(-1/2) = 2 > 0$

$\Rightarrow f^n$ has minimum value at $x = -1/2$

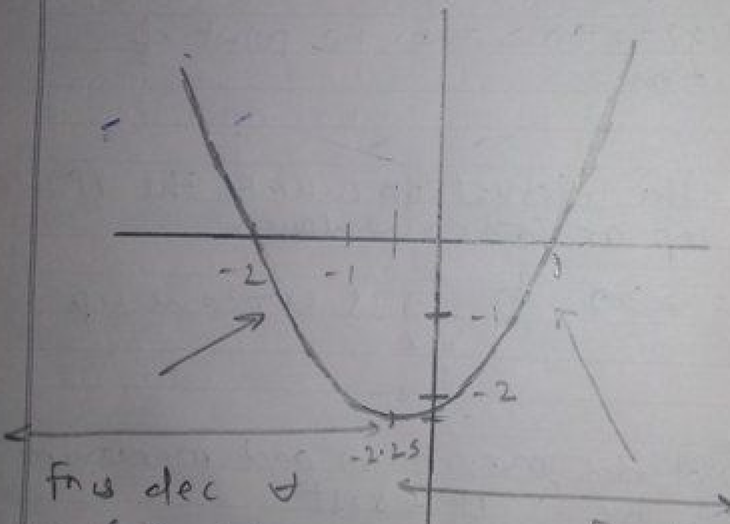
Date ____ Teacher's Signature : ____

but fn has no maximum value

$f(-1/2) = \left(-\frac{1}{2}-1\right)\left(-\frac{1}{2}+2\right) = \left(-\frac{3}{2}\right)\left(\frac{3}{2}\right) = -\frac{9}{4} = -2.25$

Step 8 fn has no asymptote (find yourself)

Step 9 sketch the curve



fn is dec $\forall$ $x \in (-\infty, -1/2)$

fn is inc $\forall$ $x \in (-1/2, \infty)$

fn is concave up $\forall$ x

Qn 1 $y = (x+1)(x+3)$ draw the graph

[Do your self]

Qn 2 $y = \cancel{x^2+1}$ $y = (x+2)(x-4)$ draw the graph [Do your self]

Qn 3 $y = (x^2-1)(x+2)$ draw the graph

[Do your self]

Qn 4 $y = (x+2)(x+3)(x-1)$ sketch graph

[do your self]

Qn 5 $y = (x-1)^2(x-2)$ draw the graph [Do your self]

Qn 6 $y = (x-1)(x-2)(x-3)$

draw the graph

[Do your self]

Qn $y = -(x+1)(x+3) = -(x^2+4x+3)$

step (1) put $x=0 \Rightarrow y=-3$
$\Rightarrow$ curve intersect at y-axes at $y=-3$

put $y=0 \Rightarrow x=-1, -3$
$\Rightarrow$ curve intersect at x-axes at $x=-1,-3$

step (2) (3) $f'(x) = -(2x+4) = 0$
$x=-2$ is critical point

$f''(x) = -2 < 0$

step (4) find the interval at which fn is increasing or decreasing

$f'(x) = -(2x+4) = -2x-4 = 0$

let ~~g(x)>0~~ $f'(x) = -2x-4 = -(2x+4)$
let $g(x) = 2x+4$
check the behave of g(x) when g(x) is +ve or -ve

$g(x)=0 \Rightarrow x=-2$

$\Rightarrow g(x) > 0$ on $x \in (-2, \infty)$
$\Rightarrow -g(x) < 0$ on $x \in (-2, \infty)$
$\Rightarrow -f'(x) = -g(x) < 0 \ \forall x \in (-2, \infty)$
$\Rightarrow$ fn is ~~i~~decreasing on $(-2, \infty)$
$\because g(x) < 0 \ \forall x \in (-\infty, -2)$

$\Rightarrow -f'(x) = g(x) > 0 \ \forall x \in (-\infty, -2)$

$\Rightarrow f(x)$ is ~~decreasing~~ increasing on $x \in (-\infty, -2)$

step(5) Identify the ~~p~~ inflection point

$\because f''(x) = -2 \neq 0 \Rightarrow$ fn has no inflection point

step(6) find out the intervals on which fn is ~~incr~~ concave up or concave down

$\because f''(x) = -2 < 0 \ \forall x$
$\Rightarrow$ fn is ~~concave~~ concave down $\forall$

step(7) find the maximum and minimum value of fn

$\because f'(x) = -2x - 4 = 0 \Rightarrow x = -2$
$f''(x) = -2 < 0$

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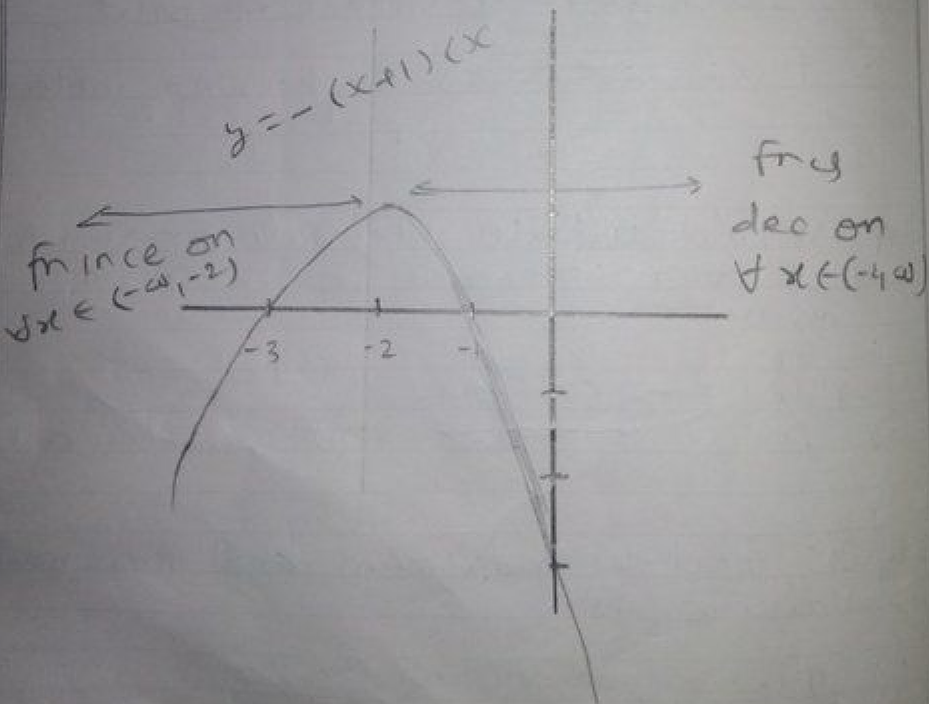
~~$f(x) = -(x+1)(x+3)$~~

$\Rightarrow$ $f(x)$ has ~~min~~ max value $\forall x$

$f(x)$ has no ~~maximum~~ minimum value

maximum value $f(-2) = -(-2+1)(-2+3) = 1$

step (8) fn $f(x)$ has no asymptote



Q. $y = (x-1)(x-2)(x-3) = x^3 - 6x^2 + 11x - 6$

put $y = 0 \Rightarrow x = 1, 2, 3 \Rightarrow$ curve intersect at $x = 1, 2, 3$ at x-axes

put $x = 0 \Rightarrow y = -6 \Rightarrow$ curve intersect at y-axes at $x = -6$

step (2) (3) $f'(x) = 3x^2 - 12x + 11$

$$f''(x) = 6x - 12$$

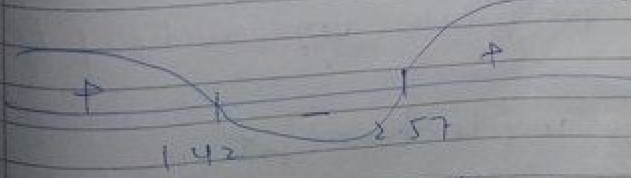
critical point $f'(x) = 0 \Rightarrow 3x^2 - 12x + 11 = 0$

$$x = \frac{6 \pm \sqrt{3}}{3} = \frac{6+\sqrt{3}}{3}, \frac{6-\sqrt{3}}{3}$$

$$x = 2.57, 1.422$$

step (4) find the interval at which fn is increasing or dec

put $f'(x) = 0 \Rightarrow x = 2.57, 1.422$



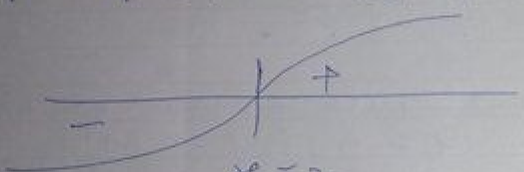
$\Rightarrow f'(x) > 0 \quad \forall x \in (-\infty, 1.42) \cup (2.57, \infty)$

$\Rightarrow f$ is increasing on $\forall x \in (-\infty, 1.42) \cup (2.5$

$\Rightarrow f'(x) < 0 \ \forall \ x \in (1.42, 2.57)$
$\Rightarrow f$ is dec on $x \in (1.42, 2.57)$

Step(5) identify the pt of inflection
$f''(x) = 6x - 12 = 0$ ~~$x = 2$~~

Find the behave of $f''(x)$
put $f''(x) = 0 \Rightarrow x = 2$



$f''(x) > 0 \ \forall x \in (2, \infty) \Rightarrow$ fn is concave up $\forall x \in (2, \infty)$

$\Rightarrow f''(x) < 0 \ \forall \ x \in (-\infty, 2) \Rightarrow$ fn is concave down $\forall \ x \in (-\infty, 2)$

$\Rightarrow x = 2$ is pt where concavity of fn changed

$\Rightarrow x = 2$ is inflection pt
Now pt of inflection on graph
$f(2) = 0$ $(2, 0)$ is the pt of

inflection on graph

~~step 7~~ maximum min value of fn

$f'(x) = 0 \Rightarrow x = 1.42, 2.57$

$f''(x) = 6x - 12$

~~$f''(1.42) = 0.098 > 0$~~

~~$\Rightarrow$ fn ~~ ~~min has min v~~

~~$f''(2.57)$~~

~~$f''(1.42)$~~ $f''\left(\frac{6-\sqrt{3}}{3}\right) = -2\sqrt{3} < 0$

$\Rightarrow$ maximum at $x = \frac{6-\sqrt{3}}{3}$

$f''\left(\frac{6+\sqrt{3}}{2}\right) = 2\sqrt{3} > 0$

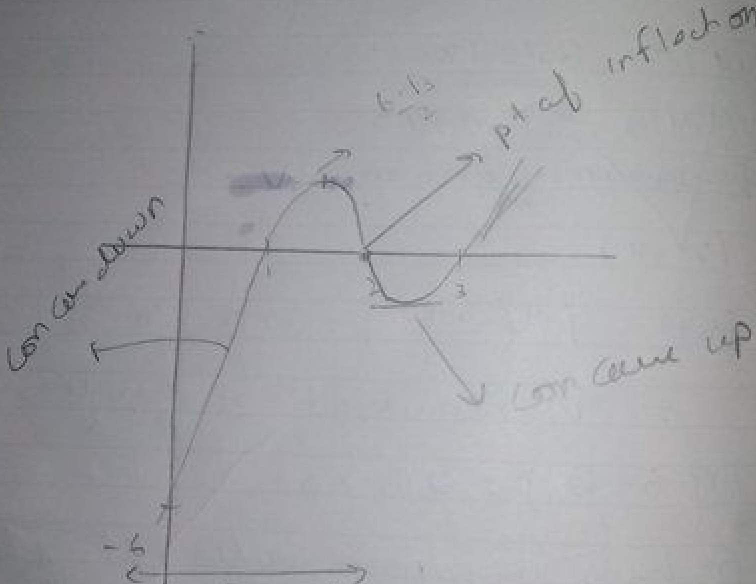
$\Rightarrow$ fn has minimum value at $x = \frac{6+\sqrt{3}}{3}$

maxim value

$f\left(\frac{6-\sqrt{3}}{3}\right) = 0.397$

min value $f\left(\frac{6+\sqrt{3}}{3}\right) = -0.3848$

step (8) fn has no asymptote



increasing
on $x \in (-\infty, 1.42) \cup (2.57, \infty)$

fn is dec on $\forall x \in (1.42, 2.57$