~~for y-intersection put x=0 => y=1/0~~
~~=> f(x) cuts y-intercept at (0, 1/0)~~

Q. $y = (x-1)(x-2)$ sketch the curve.

$= x^2 - 3x + 2$ — (1)

Soln

Step 1 find the intercepts with the co-ordinate axis y-intercepts is obtained by setting $x=0$ and x-intercepts are the real roots of the eqn put $f(x) = 0 = y$

=> put $x=0$ in eqn (1) we get $y = (0-1)(0-2)$
$\Rightarrow y = 2$

put $y=0$ in eqn (1) we get $(x-1)(x-2)=0$
$\Rightarrow x = 1, 2$

=> curve intersect at x-axis at $x = 1, 2$
& intersect at y-axis at $y = 2$

Step (2), (3) find $f'(x)$, $f''(x)$ and critical pts

$f'(x) = 2x - 3$

critical pt => $f'(x) = 0 \Rightarrow x = 3/2$

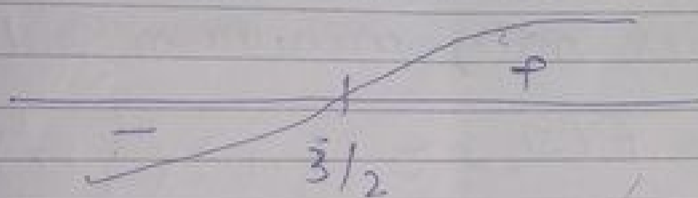
$f''(x) = 2 > 0$

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

$f'(x) = 2x - 3 = g(x)$

$g(x) = 2x - 3$ check the behave of fn $g(x)$ where $g(x) > 0$ or $g(x) < 0$

Now $g(x) = 0 \Rightarrow 2x - 3 = 0 \quad x = 3/2$



$g(x) > 0$ on $x \in (3/2, \infty) \Rightarrow g(x) = f'(x) > 0$ on $x \in (3/2, \infty)$

$g(x) < 0$ on $x \in (-\infty, 3/2) \Rightarrow g(x) = f'(x) < 0$ on $x \in (3/2, \infty)$

$\Rightarrow f'(x) > 0$ on $x \in (3/2, \infty) \Rightarrow$ fn is increasing on $(3/2, \infty)$

$\because f'(x) < 0$ on $x \in (-\infty, 3/2) \Rightarrow$ fn is decreasing on $(-\infty, 3/2)$

Step(5) Identify any points of inflection
$\because f''(x) = 2 \neq 0 > 0 \Rightarrow$ no point of inflection

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Step 6 find the interval on which the fn is concave up or concave down

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

<u>Step 7</u> find the maximum and minimum values of the fn ~~is~~ if exist

$\because f'(x) = 2x - 3$ & $f'(x) = 0 \Rightarrow x = 3/2$

$f''(x) = 2 > 0$ ~~$\forall x \in R$~~ $\Rightarrow f''(3/2) = 2 > 0$

$\Rightarrow$ fn has only minimum value

~~$f''(3/2)$~~ $f(3/2) = \left(\frac{3}{2} - 1\right)\left(\frac{3}{2} - 2\right)$

$= \left(\frac{3-2}{2}\right)\left(\frac{3-4}{2}\right) = \frac{1}{2} \times -\frac{1}{2}$

$= -\frac{1}{4}$

$f(3/2) = -1/4$ minimum value of fn at $x = 3/2$

fn has no maximum value

Step 8 Identify asymptote

for horizontal asymptote a line $y = b$ is a horizontal asymptote of graph f if

$\lim_{x \to \infty} f(x) = b$ or $\lim_{x \to -\infty} f(x) = b$

$\therefore b =$ must be finite

$\Rightarrow$ in this fn $y = x^2 - 3x + 2$ there is no finite value $y = b$ s.t

$\lim_{x \to \infty} f(x) = b$ or $\lim_{x \to -\infty} f(x) = b$

$\Rightarrow$ no horizontal asymptote

$\rightarrow$ for vertical asymptote: A line $x = a$ is vertical asymptote of the graph $f(x)$ if either sided limit

$\lim_{x \to a^-} f(x)$ infinite or $\lim_{x \to a^+} f(x)$ infinite

Here $y = x^2 - 3x + 2$ there is no value of $x = a$ (finite) s.t

$\lim_{x \to a^-} f(x)$ is infinite or $\lim_{x \to a^+} f(x)$ infinite

$\Rightarrow$ no vertical asymptote