9. $f(x)$, $f'(x) = \dfrac{x^2-2x}{x-4}$ where increasing / decreasing?

$f(x)$ <u>can</u> change from inc to dec etc at critical numbers i.e. where $f'(x)=0$ or $f'(x)$ is undefined.

find CNs:

$f'(x) = \dfrac{x^2-2x}{x-4} = \dfrac{x(x-2)}{x-4} = 0$ $\Rightarrow$ numerator $=0$ <u>and</u> denom $\neq 0$

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

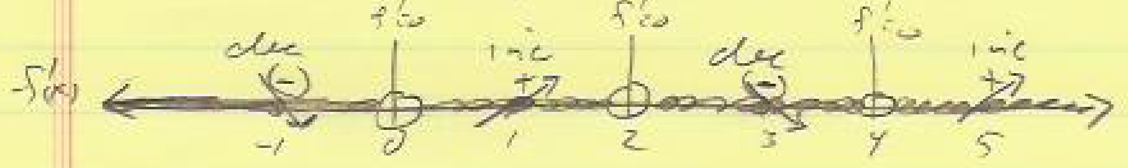
$\boxed{x_c = 0,\ x_c = 2 \text{ bcs } f' = 0}$

$f'(x) = \dfrac{x(x-2)}{x-4}$ is undefined where denominator $=0$

$\Rightarrow$ solve $x-4=0 \rightarrow \boxed{x_c = 4}$ bcs f' undefined

<u>CNs</u> $x_c = 0, 2, 4$ give boundaries where $f(x)$ can change from $\uparrow$ to $\downarrow$ or $\downarrow$ to $\uparrow$

must test one point in each interval.



$f'(-1) = \dfrac{(-1)(-1-2)}{(-1-4)} = \dfrac{(-)(-)}{(-)} = (-) \searrow$ decreasing

$f'(1) = \dfrac{(1)(1-2)}{(1-4)} = \dfrac{(+)(-)}{(-)} = (+) \nearrow$ increasing

$f'(3) = \dfrac{(3)(3-2)}{(3-4)} = \dfrac{(+)(+)}{(-)} = (-) \searrow$ decreasing

$f'(5) = \dfrac{(5)(5-2)}{(5-4)} = \dfrac{(+)(+)}{(+)} = + \nearrow$ increasing

$f(x)$ is increasing for x in intervals $(0,2)$, $(4,+\infty)$

$f(x)$ is decreasing for x in intervals $(-\infty,0)$, $(2,4)$