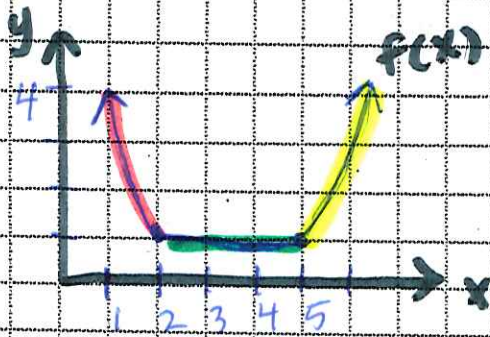


Increasing and Decreasing Functions

12/13

ES: How do we determine when a function is increasing or decreasing?

What are the intervals for which $f(x)$ is increasing, decreasing and constant?



$f(x)$ is increasing on the interval $(5, \infty)$

$f(x)$ is decreasing on the interval $(-\infty, 2)$

$f(x)$ is constant on the interval $(2, 5)$

What if I do not have a graph?

Test for increasing and decreasing functions

- ① If $f'(x) > 0$ for all x in (a, b) , then $f(x)$ is increasing on $[a, b]$.
- ② If $f'(x) < 0$ for all x in (a, b) , then $f(x)$ is decreasing on $[a, b]$.
- ③ If $f'(x) = 0$ for all x in (a, b) , then $f(x)$ is constant on $[a, b]$.

EX

Find the open interval where $f(x)$ is increasing or decreasing.

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

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

(Step 1) Find the critical numbers.

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

$$0 = 3x^2 - 3x$$

$$0 = 3x(x-1)$$

$$3x = 0$$

$$x = 0$$

$$x-1 = 0$$

$$x = 1$$

critical numbers

(Step 2) Test a value in each interval

Interval	$(-\infty, 0)$	$(0, 1)$	$(1, \infty)$
test value	$x = -1$	$x = 0.5$	$x = 2$
Sign of $f'(x)$	$f'(-1) = 6$ $6 > 0$	$f'(0.5) = -0.75$ $-0.75 < 0$	$f'(2) = 6$ $6 > 0$
Conclusion	Increasing	Decreasing	Increasing

(Step 3)



Determine if $f(x)$ is increasing or decreasing

Summary