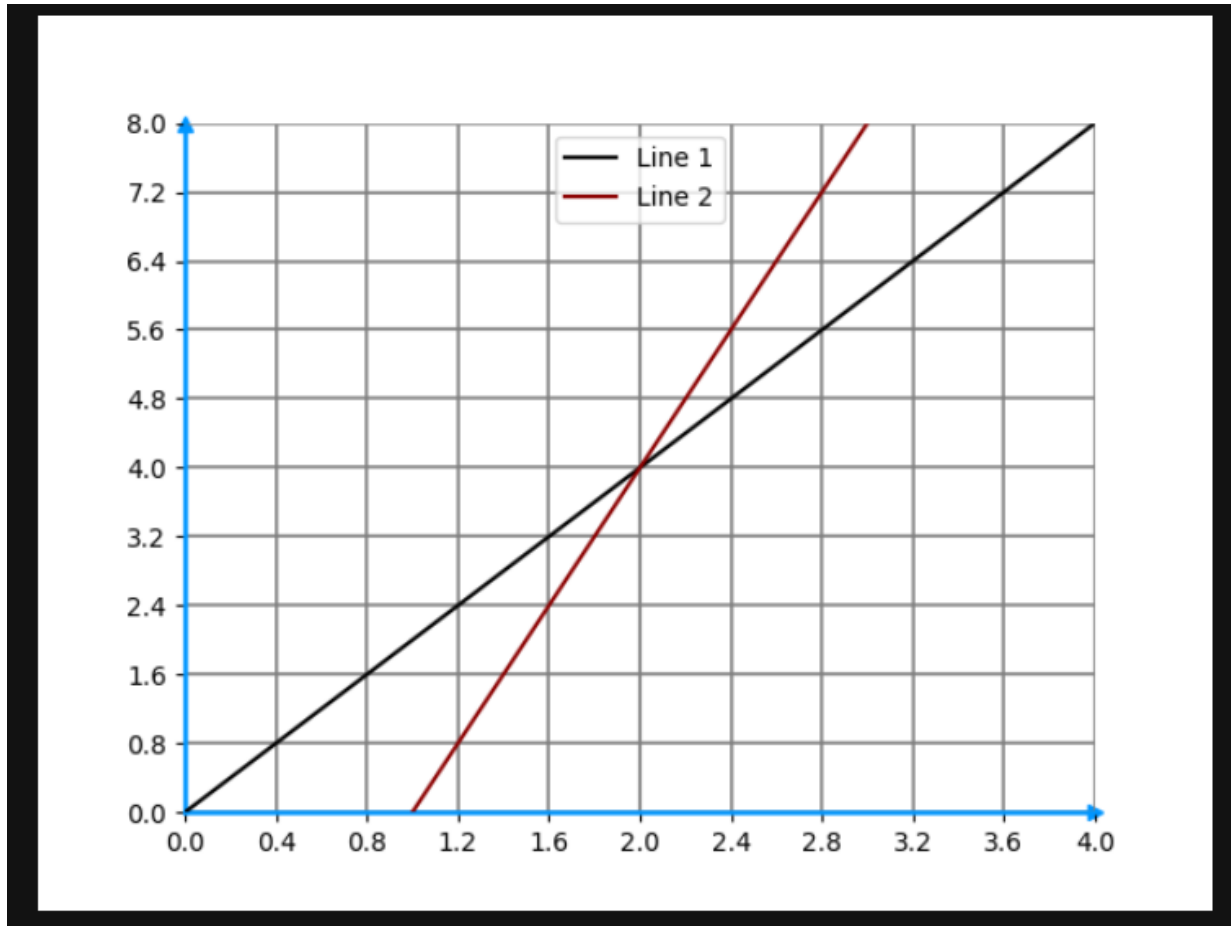


Quiz #1 : Derivatives

Question 1

Consider the following lines.



To help you calculate the weight of each rock sample, your spacecraft user interface requires you to input the system of equations that represents the weights of the samples on each one of the rovers.

What can be said about their slopes at their intersection?

a):- $\text{Slope}(\text{Line 1}) > \text{Slope}(\text{Line 2})$.

b):- $\text{Slope}(\text{Line 1}) < \text{Slope}(\text{Line 2})$.

c):- Slope(Line 1) = Slope(Line 2).

d):- It is impossible to infer anything with the given information.

Answer:- b

Q #1:- at point (2, 4)

for line 1:-

$$P_1(1.6, 3.2)$$
$$P_2(2, 4)$$
$$\text{slope} = \frac{4 - 3.2}{2 - 1.6} = 2$$

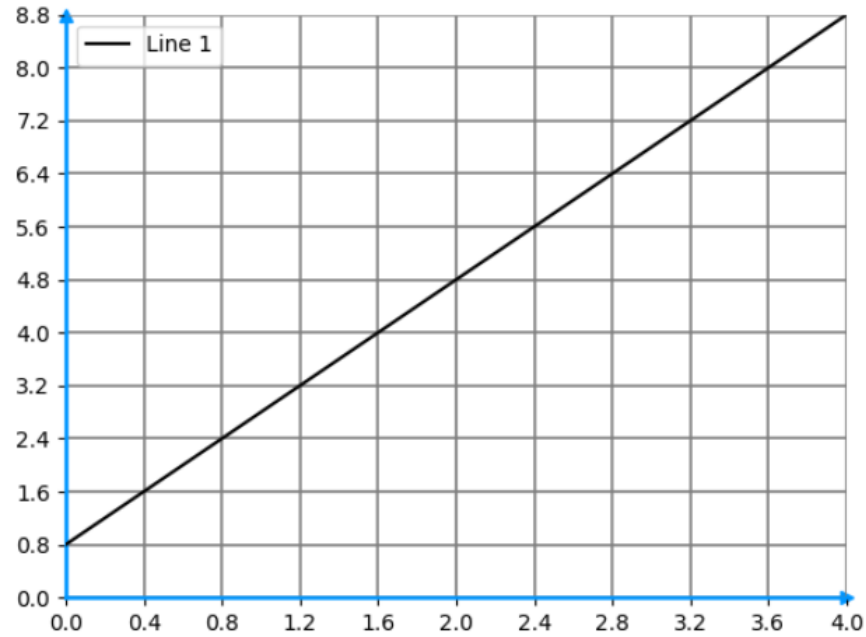
for line 2:-

$$P_1(1.6, 2.4)$$
$$P_2(2, 4)$$
$$\text{slope} = \frac{4 - 2.4}{2 - 1.6} = 4$$

Slope line 2 > Slope line 1

Question 2

Given the following graph, what is the slope of the line? You can pick any two points to calculate the slope.



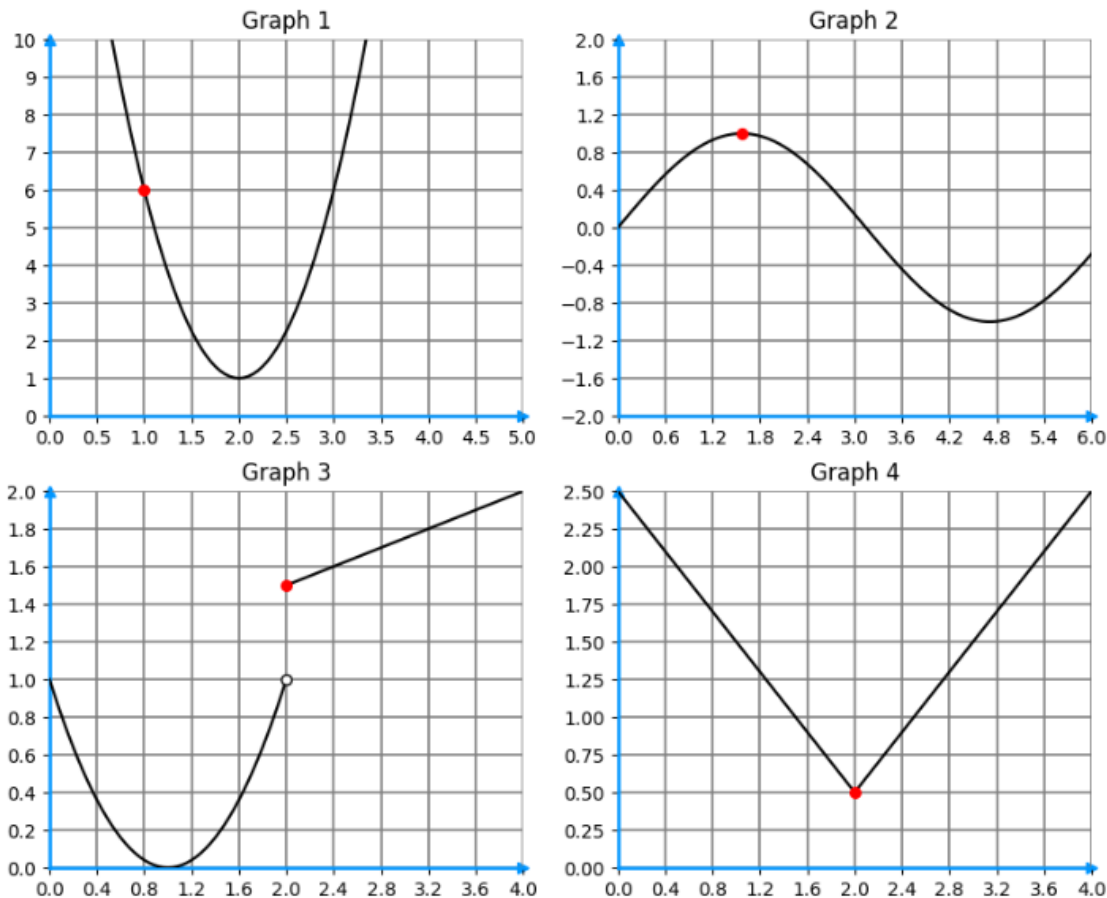
Answer:- answer is 2

2):- $P_1 (0.4, 1.6)$
 $P_2 (0.8, 2.4)$

$$\text{Slope} = \frac{y_2 - y_1}{x_2 - x_1}$$
$$= \frac{2.4 - 1.6}{0.8 - 0.4}$$
$$= 2$$

Question 3

Consider the graphs below



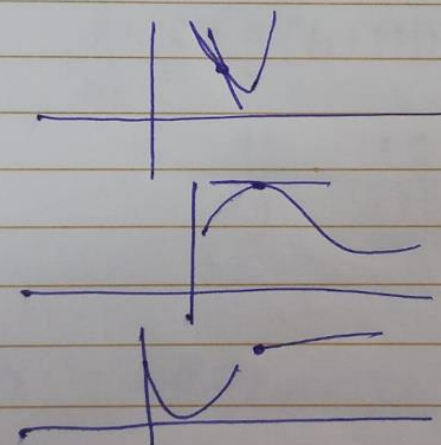
What can be said about the curve's slopes at the red point, which we will call P1, P2, P3 and P4, corresponding to the red points in the graphs 1, 2, 3 and 4, respectively?

- a):- $\text{Slope}(P1) > 0$, $\text{Slope}(P2) < 0$, $\text{Slope}(P3)$ does not exist, $\text{Slope}(P4) = 0$.
- b):- $\text{Slope}(P1) < 0$, $\text{Slope}(P2) = 0$, $\text{Slope}(P3) > 0$, $\text{Slope}(P4)$ does not exist.
- c):- $\text{Slope}(P1) < 0$, $\text{Slope}(P2) = 0$, $\text{Slope}(P3)$ does not exist, $\text{Slope}(P4)$ does not exist.
- d):- $\text{Slope}(P1) < 0$, $\text{Slope}(P2) = 0$, $\text{Slope}(P3)$ does not exist, $\text{Slope}(P4) > 0$.

Answer:- c

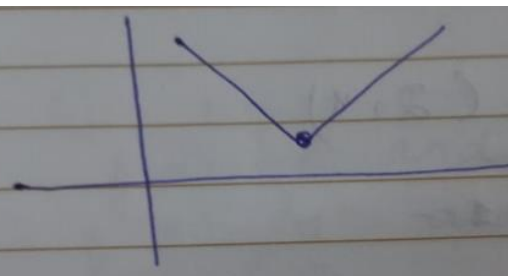
3):- slopes at red points of g_1, g_2, g_3 & g_4 is :-
 P_1, P_2, P_3 and P_4 respectively.

c is correct b/c for a line, given below slope is -ve.



slope = 0

slope = does not exist
b/c of jump
discontinuity.



slope does not
exist b/c of
a cusp.

Question 4

Let $y_1 = ax + b$ and $y_2 = cx + d$, where $a, b, c, d \in \mathbb{R}$. Check all the sentences that are true.

a):- The slope of y_1 is a .

b):- The slope of y_1 is $-b/a$

c):- if $a > c$ then the slope of y_1 is greater than the slope of y_2 .

d):- The slope of y_1 does not depend on b .

Answer:- a, c and d

4):- $y_1 = ax + b$
 $y_2 = cx + d$

a):- slope of $y_1 = y_1' = a$.

d):- the slope of y_1 does not depend on b b/c $y_1' = a$.

for option c let's consider values:-
 $a = 4, c = 2$
 $y_1 = 4x + b$
 $y_2 = 2x + d$
 $y_1' = 4$
 $y_2' = 2$
 $y_1' > y_2'$

So answer is a, c and d.

Question 5

Which of the following sentences are true (check all that apply)?

a):- If the slope of a function is constant, then the function is constant.

b):- If the slope of a function is always positive, then the function is always positive.

c):- Let f, g be real functions. If $f'(x) > g'(x)$ then $f(x) > g(x)$.

d):- Let f be a real function. If $f'(x) > 0$ for every x in \mathbb{R} , then f is increasing.

Answer:- d

Q#5:-

a):- false
b/c e.g. $f(x) = 2x$ $f'(x) = 2$
slope is constant b/c $f(x)$ is not
so it can't be true.

b):- false b/c consider a $f(x) = x - 1$
 $\Rightarrow f'(x) = 1$
but the $f(x)$ can have -ve value for
specific values of x e.g. at $x = -3$
 $f(x) = -4$ but slope will
be positive i.e. 1 so it can't be
true.

Answer is d.