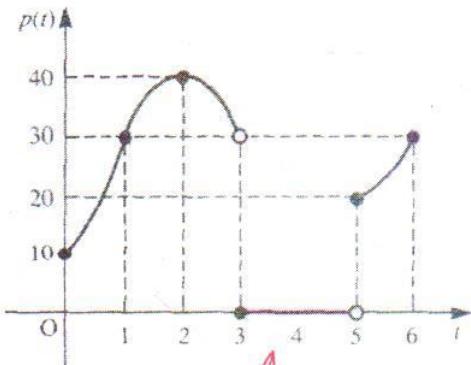


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Unit 1 Quiz: Limits and Rates of Change

1. The function $P(t)$ describes the production of unleaded gasoline, in thousands of liters, where time t is measured in days.



I didn't see
the line on zero

a) Determine $\lim_{t \rightarrow 1} p(t)$

30,000 L

✓ OK

b) Determine $\lim_{t \rightarrow 3^+} p(t)$

DNE

X Ø

3.5
6.

c) Determine $\lim_{t \rightarrow 3^-} p(t)$

30,000 L

✓ OK

- d) At which day was the production highest?

Day 2

- e) When was the refinery shut down for repairs?

Day 3 < t < 5

✓

3 ≤ t < 5

- f) For what value(s) is $p(t)$ discontinuous?

1, 2

X

2. a) Graph the piecewise function

$$f(x) = \begin{cases} -x^2 + 5 & \text{for } x \leq 2 \\ 5 - x^2 & \text{for } 2 < x \leq 2 \\ 2x - 1 & \text{for } x > 2 \end{cases}$$

b) $f(2) = 1$

$x = 2$

c) When is $f(x)$ discontinuous? $x \neq 2$

X

d) $\lim_{x \rightarrow 0^-} f(x) = 5$

✓

e) $\lim_{x \rightarrow 0^+} f(x) = 5$

✓

f) $\lim_{x \rightarrow 2^-} f(x) = 1$

✓

g) $\lim_{x \rightarrow 2^+} f(x) = 3$

✓

- h) Does $\lim_{x \rightarrow 0} f(x)$ exist? Explain.

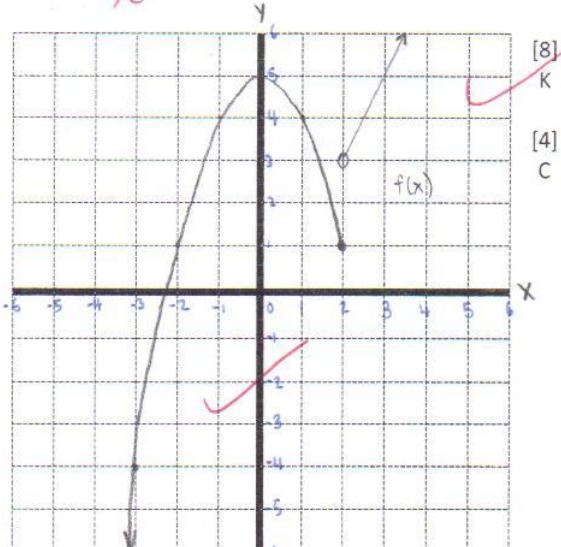
yes. It is continuous. Both $x \rightarrow 0^-$ and $x \rightarrow 0^+$ both approaches 5.

AND x at 0 has a value of five. The function goes right through with one curve

- i) Does $\lim_{x \rightarrow 2} f(x)$ exist? Explain

No. It has a jumping discontinuity. The function stops at $(2, 1)$ then

jumps up to $(2, 3)$. $x \rightarrow 2^-$ and $x \rightarrow 2^+$ have diff values. A curve or line cannot go through at point $x = 2$



7/8

4/4

10.5+4

3. A dragster races down a 400 m strip in 10 seconds. Its distance in meters from the starting time after t seconds is given by the formula $d(t) = 3t^2 + 10t$.

a) Determine the average velocity of the dragster from $t = 5$ seconds to $t = 8$ seconds.

$$\begin{aligned}\vec{V}_{\text{avg.}} &= \frac{\vec{\Delta d}}{\Delta t} \\ &= \frac{+272 \text{ m} - 125 \text{ m}}{8 \text{ s} - 5 \text{ s}} \\ &= \frac{+147 \text{ m}}{3 \text{ s}} \\ &= +49 \text{ m/s} \\ &= 49 \text{ m/s [forward]}\end{aligned}$$

$$\begin{array}{ll}\text{distance at } 5\text{s} & \text{distance at } 8\text{s} \\ d(5) = 3(5)^2 + 10(5) & d(8) = 3(8)^2 + 10(8) \\ = 3(25) + 50 & = 3(64) + 80 \\ = 125 \text{ m} & = 272 \text{ m}\end{array}$$

therefore, the average velocity from 5s to 8s is 49 m/s [Forward]

[3]
A

b) Determine its instantaneous velocity at $t = 10$ s.

$$\begin{aligned}\vec{V}_{\text{inst.}} &= \lim_{h \rightarrow 0} \frac{f(10+h) - f(10)}{h} \\ &= \lim_{h \rightarrow 0} \frac{f(10+h) - f(10)}{h} \\ &= \lim_{h \rightarrow 0} \frac{[3(10+h)^2 + 10(10+h)] - [3(10)^2 + 10(10)]}{h} \\ &= \lim_{h \rightarrow 0} \frac{3(100+20h+h^2)+100+10h-300-100}{h} \\ &= \lim_{h \rightarrow 0} \frac{300+60h+3h^2+100+10h-400}{h} \\ &= \lim_{h \rightarrow 0} \frac{70h+3h^2}{h} \\ &= \lim_{h \rightarrow 0} \frac{h(70+3h)}{h}\end{aligned}$$

$$\begin{aligned}&\Rightarrow \lim_{h \rightarrow 0} (70+3h) \\ &= 70 + 3(0) \\ &= 70 \text{ m/s} \\ &= 70 \text{ m/s [forward]}\end{aligned}$$

Therefore, the instantaneous velocity at 10 seconds was 70 m/s [forward]

[4]
A

4. Let $f(x) = ax^2 + bx$, where a and b are constants. If $\lim_{x \rightarrow 1} f(x) = 5$ and $\lim_{x \rightarrow -2} f(x) = 8$, find the values of a and b .

$$5 = \lim_{x \rightarrow 1} ax^2 + bx$$

$$= a(1)^2 + b(1)$$

$$= a + b$$

$$b = 5 - a \quad \textcircled{1}$$

$$8 = \lim_{x \rightarrow -2} ax^2 + bx$$

$$= a(-2)^2 + b(-2)$$

$$= a(4) - 2b \quad \textcircled{2}$$

$$= a(4) - 2(5-a)$$

$$= 4a - 10 + 2a$$

$$0 = 6a - 10 - 8$$

$$= 6a - 18$$

$$a = \frac{18}{6}$$

$$= 3 \quad \textcircled{3}$$

sub $\textcircled{3}$ into $\textcircled{1}$

$$b = 5 - a$$

$$= 5 - (3)$$

$$= 2$$

Therefore, the value of a is 3, and the value of b is 2

[4]
A

4/4

11/11