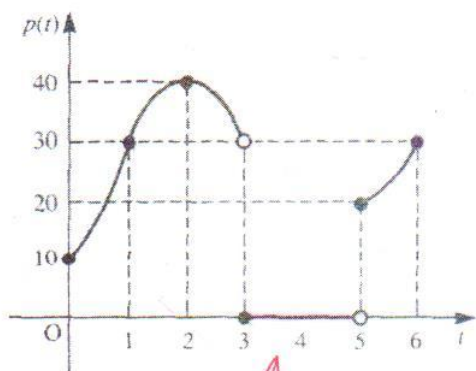


88%

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. [6]
K



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 ✗ 0

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 $3 < t < 5$

$3 \leq t < 5$

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

1, 2 ✗

2. a) Graph the piecewise function

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

b) $f(2) = 1$ ✓

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

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

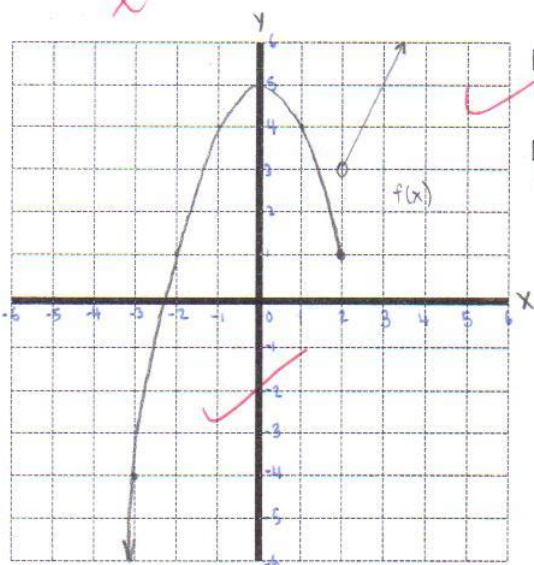
h) Does $\lim_{x \rightarrow 0} f(x)$ exist? Explain.

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 jump 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 $x = 2$ ✓



[8]
K

[4]
C

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.

$$\vec{V}_{avg} = \frac{\Delta d}{\Delta t}$$

$$= \frac{+272m - (+125m)}{8s - 5s}$$

$$= \frac{+147m}{3s}$$

$$= +49 \text{ m/s}$$

$$= 49 \text{ m/s [forward]}$$

distance at 5s

$$d(5) = 3(5)^2 + 10(5)$$

$$= 3(25) + 50$$

$$= 125m$$

distance at 8s

$$d(8) = 3(8)^2 + 10(8)$$

$$= 3(64) + 80$$

$$= 272m$$

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

[3]
A

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

$$\vec{V}_{int.} = \lim_{h \rightarrow 0} \frac{f(a+h) - f(a)}{h}$$

$$= \lim_{h \rightarrow 0} \frac{f(10+h) - f(10)}{h}$$

$$= \lim_{h \rightarrow 0} \frac{[3(10+h)^2 + 10(10+h)] - [3(10)^2 + 10(10)]}{h}$$

$$= \lim_{h \rightarrow 0} \frac{3(100 + 20h + h^2) + 100 + 10h - 300 - 100}{h}$$

$$= \lim_{h \rightarrow 0} \frac{300 + 60h + 3h^2 + 100 + 10h - 400}{h}$$

$$= \lim_{h \rightarrow 0} \frac{70h + 3h^2}{h}$$

$$= \lim_{h \rightarrow 0} \frac{h(70 + 3h)}{h}$$

$$= \lim_{h \rightarrow 0} (70 + 3h)$$

$$= 70 + 3(0)$$

$$= +70 \text{ m/s}$$

$$= 70 \text{ m/s [forward]}$$

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 .

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

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

$$= a + b$$

$$b = 5 - a$$

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

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

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

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

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

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

$$= 6a - 18$$

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

$$= 3$$

sub (3) into (1)

$$b = 5 - a$$

$$= 5 - (3)$$

$$= 2$$

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

[4]
A