

Don't get "horizontal" and "vertical" mixed up! [Likewise, $-\infty$ and ∞]

6. Let f be the function defined by $f(x) = \frac{x^2 - 4}{x^2 + x - 2}$. Which of the following statements is/are true about f ?

- I. $\lim_{x \rightarrow -2} f(x)$ does not exist
 II. $y = 1$ is a horizontal asymptote of f
 III. $x = 1$ is a vertical asymptote of f

- (A) I only
 (B) II only
 (C) III only
 (D) II and III only
 (E) I, II, and III

Handwritten work for question 6:

$$\lim_{x \rightarrow -2} \frac{(x+2)(x-2)}{(x+2)(x-1)} = \lim_{x \rightarrow -2} \frac{x-2}{x-1}$$

$$\lim_{x \rightarrow \infty} \frac{x^2 - 4}{x^2 + x - 2} = \lim_{x \rightarrow \infty} \frac{x^2}{x^2} = 1$$

Annotations: "False" and "TRUE" are written next to statement I. "TRUE" is written next to statement III.

7. What are all of the horizontal asymptotes of the graph of $y = \frac{7-3^x}{14+3^x}$?

- (A) $y = 0$
 (B) $y = \frac{1}{2}$
 (C) $y = -1$
 (D) $y = 0$ and $y = -1$
 (E) $y = 0$, $y = \frac{1}{2}$, and $y = -1$

Handwritten work for question 7:

$$\lim_{x \rightarrow \infty} \frac{7-3^x}{14+3^x} = -1$$

$$\lim_{x \rightarrow -\infty} \frac{7-3^x}{14+3^x} = \frac{1}{2}$$

My bad! I need to re-write this one. Circle any that apply.

What do you mean by "average"?

8. Let f be the function defined by $f(x) = \frac{1}{x^2}$. What is the average rate of change for the closed interval $[1, 2]$?

- (A) 0.75
- (B) -0.75
- (C) 0.50
- (D) -0.50
- (E) 1

$$\begin{aligned} \text{AR of } \Delta &= \frac{f(2) - f(1)}{2 - 1} \\ &= \frac{\frac{1}{4} - 1}{1} \end{aligned}$$

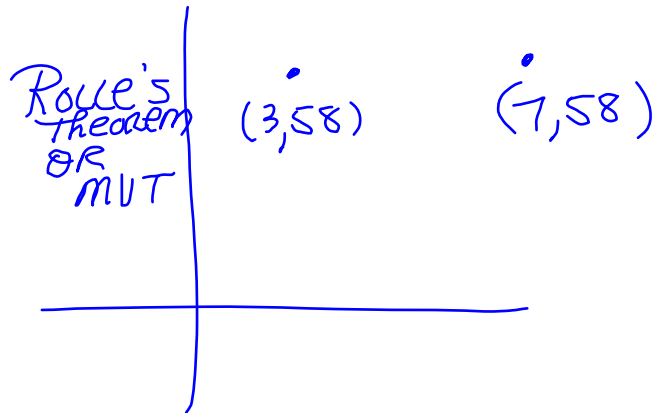
9. What is the average value of $y = \frac{1}{x^2}$ on the closed interval $[1, 2]$?

- (A) 0.75
- (B) -0.75
- (C) 0.50
- (D) -0.50
- (E) 1

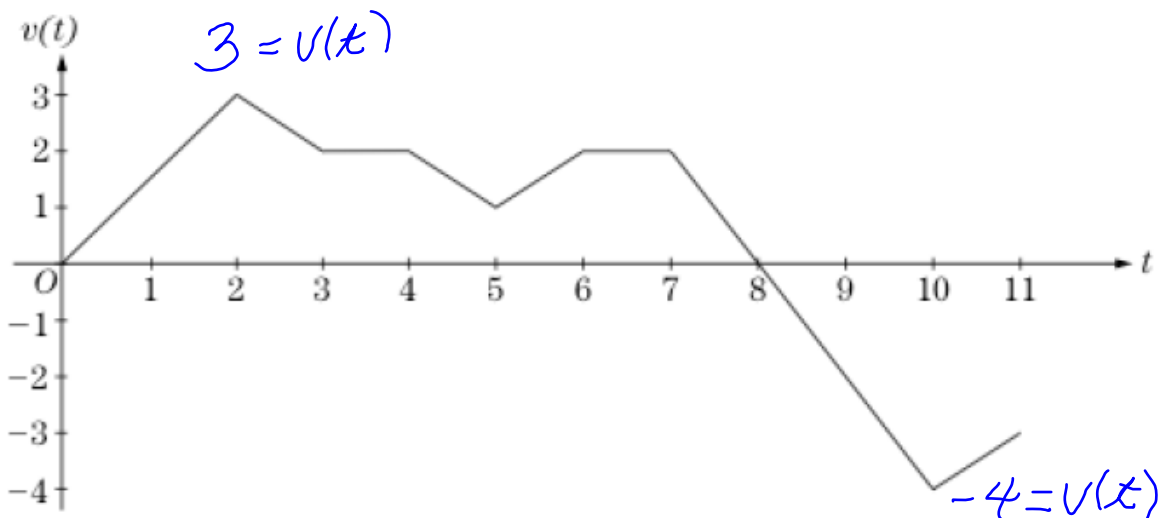
$$\begin{aligned} \frac{1}{2-1} \int_1^2 x^{-2} dx &= \left. -\frac{1}{x} \right|_1^2 \\ &= -\frac{1}{2} - (-1) \end{aligned}$$

10. Let f be a twice-differentiable function on the closed interval $[3, 7]$ with $f(3) = f(7)$. Which of the following statements must be true about f ?

- (A) f is concave down on $[3, 7]$
- (B) There is a c , $3 < c < 7$, such that $f(c) = 0$
- (C) There is a c , $3 < c < 7$, such that $f'(c) = 0$
- (D) There is a c , $3 < c < 7$, such that $f''(c) = 0$
- (E) $f'(3) > f'(7)$



Those motion problems will never go away!



A bug is crawling along a straight wire. The velocity, $v(t)$, of the bug at time t , $0 \leq t \leq 11$, is given in the graph above.

11.

According to the graph, at what time t does the bug change direction?

- (A) 2
- (B) 5
- (C) 6
- (D) 8
- (E) 10

At $t=8$ $v(t)$ changes from positive to negative values

12.

According to the graph, at what time t is the speed of the bug greatest?

- (A) 2
- (B) 5
- (C) 6
- (D) 8
- (E) 10

SPEED = $|v(t)|$