

MAC 2311 Section 3137

Participation Activity

1. The position function of a ball thrown into the air is given by $H(t) = 5t - 2t^2$ where $H(t)$ is the height of the ball above the ground after t seconds.

(a) Find the average velocity of the ball on the interval starting with $t = 1$ to the time 0.1 seconds later.

[1, 1.1]

$$H(t) = 5t - 2t^2$$

$$\frac{H(1.1) - H(1)}{1.1 - 1} = \frac{5(1.1) - 2(1.1)^2 - 5 + 2}{0.1}$$

$$= \frac{0.5 - 0.42}{0.1} = \frac{0.08}{0.1} \times \frac{100}{100} = \frac{8}{10} = \frac{4}{5}$$

(b) Now write an expression for the average velocity of the ball on the time from $t = 1$ to h seconds later, where $h \neq 0$.

[1, 1+h]

$$\frac{5(1+h) - 2(1+h)^2 - 5 + 2}{h} = \frac{5 + 5h - 2 - 4h - 2h^2 - 5 + 2}{h}$$

$$= \frac{h - 2h^2}{h} = 1 - 2h$$

(c) What happens as h gets closer and closer to 0?

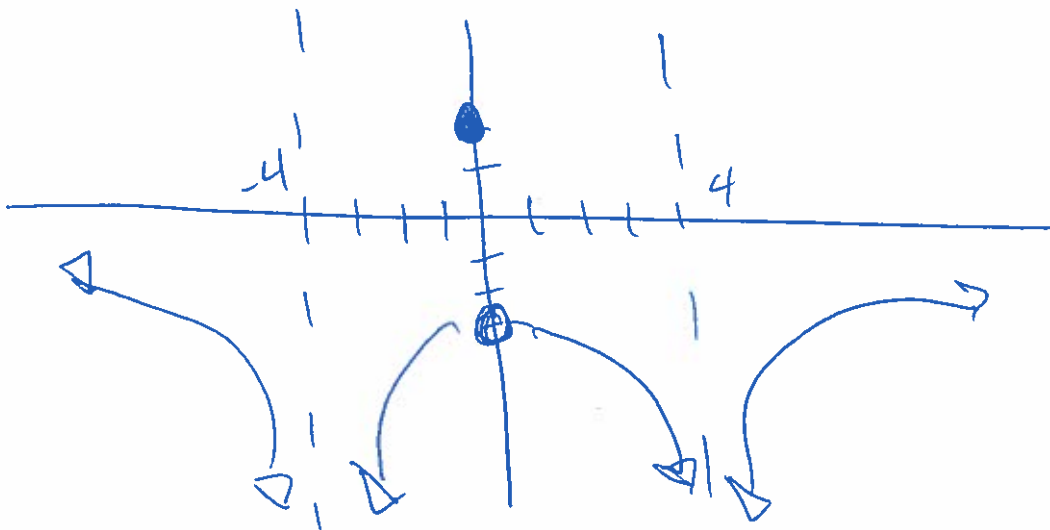
$$h \rightarrow 0 \quad \text{then} \quad 1 - 2h \rightarrow 1$$

(d) Find the instantaneous velocity of the ball when $t = 1$.

$$1 \text{ ft/sec}$$

2. Sketch an even function f such that:

$$\lim_{x \rightarrow 0^+} f(x) = -3, \quad \lim_{x \rightarrow 4} f(x) = -\infty, \quad f(0) = 2$$



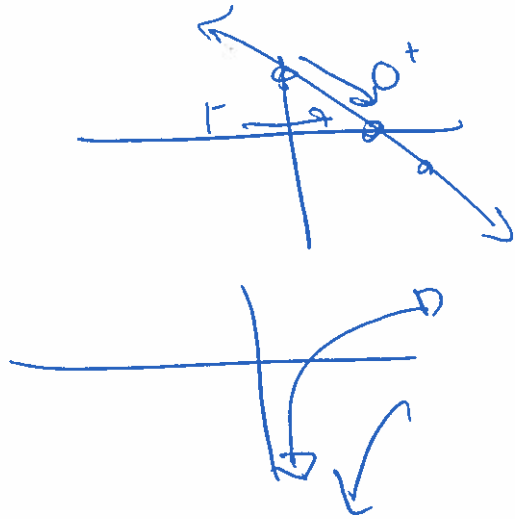
3. Evaluate the limit.

$$\lim_{x \rightarrow 1^-} \ln(1-x)$$

$$= \ln\left(\lim_{x \rightarrow 1^-} (1-x)\right)$$

$$= \ln(0^+)$$

$$= -\infty$$



4. Suppose $\lim_{x \rightarrow 5^-} f(x) = 4$ and $\lim_{x \rightarrow 5^+} f(x) = 0$.

(a) Does $\lim_{x \rightarrow 5} f(x)$ exist?

NO

(b) If so, what is the $\lim_{x \rightarrow 5} f(x)$?

(c) If not, give a reason why the limit does not exist.

$$\text{Since } \lim_{x \rightarrow 5^+} f(x) \neq \lim_{x \rightarrow 5^-} f(x)$$

5. Sketch a graph of a function f that satisfies all of the given condition. There are many different solutions.

$$\lim_{x \rightarrow 1^-} f(x) = -2, \quad \lim_{x \rightarrow 1^+} f(x) = 0, \quad f(1) = 3$$

