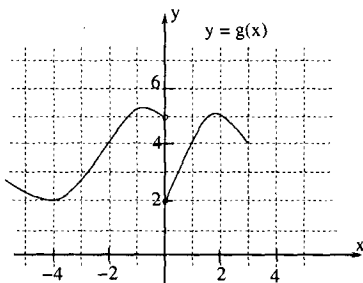


8. (10 pts) Suppose  $f(x) = |x|/x$ , and suppose  $g(x)$  is given by the following graph:



(a) Calculate  $\lim_{x \rightarrow 0^+} f(x)g(x) =$

$$\lim_{x \rightarrow 0^+} f(x) \cdot g(x) = \left( \lim_{x \rightarrow 0^+} f(x) \right) \left( \lim_{x \rightarrow 0^+} g(x) \right)$$

$$= 1 \cdot 2 = 2$$

(b) Calculate  $\lim_{x \rightarrow 0^-} 2f(x) + 3g(x) =$

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

$$= 2 \cdot (-1) + 3 \cdot 5 = 13$$

9. (10 pts)

(a) State the Intermediate Value Theorem.

let  $f$  be continuous on  $[a, b]$  with  $f(a) = a$ ,  $f(b) = b$ .

then  $f$  must assume all values between  $a$  and  $b$ .

(b) Use the Theorem to determine whether or not the function  $f(x) = x^5 - 6x - 1$  has a root (zero) between  $x = 1$  and  $x = 2$ . Explain carefully how you used the Intermediate Value Theorem to obtain your answer.

note  $f(1) = 1 - 6 - 1 = -6 < 0$

$$f(2) = 32 - 12 - 1 = 19 > 0$$

yes  $f$  has a zero between  $x=1$  and  $x=2$

b/c  $f(1) < 0$  and  $f(2) > 0$