2.2 Basic Differentiation Rules Cont.

ex: Differentiate.

a) $f(x)=\begin{cases} x^2+3, & x\le 0 \\ e^x-x, & x>0 \end{cases}$

ex: Differentiate.

b) $f(x) = |x + 4|$

ex: Differentiate.

c) $g(x)=\begin{cases} 2, & x<7 \\ 3-5x, & x\geq 7 \end{cases}$

ex: Find the slope at the indicated x-value or explain why it does not exist.

a) $f(x) = |x+4|, \quad x = 0$

b) $f(x) = |x+4|, \quad x = -5$

c) $f(x) = |x+4|, \quad x = -4$

ex:

$$f(x)=\begin{cases} 2x-2 & \text{for } x<3 \\ 2x-4 & \text{for } x\geq 3 \end{cases}$$

Let f be the piecewise-linear function defined above. Which of the following statements are true?

I. $\lim_{h\to 0^-} \frac{f(3+h)-f(3)}{h}=2$

II. $\lim_{h\to 0^+} \frac{f(3+h)-f(3)}{h}=2$

III. $f'(3)=2$

(A) None

(B) II only

(C) I and II only

(D) I, II, and III

ex: Find a and b so that f(x) is differentiable.

$$g(x)=\begin{cases}2x-x^2, & x\le 1\\ x^2+ax+b, & x>1\end{cases}$$

FR 1

Let $f(x) = 4x^3 - 3x - 1$.

(a) Find the x-intercepts of the graph of f.

(b) Write an equation for the tangent line to the graph of f at $x = 2$.

FR 4

Let f be the function defined as follows:

$$f(x)=\begin{cases} |x-1|+2, & \text{for } x<1 \\ ax^2+bx, & \text{for } x\geq 1, \text{ where } a \text{ and } b \text{ are constants.} \end{cases}$$

(a) If $a=2$ and $b=3$, is f continuous for all x? Justify your answer.

(b) Describe all values of a and b for which f is a continuous function.

(c) For what values of a and b is f both continuous and differentiable?

ex:

At $x = 3$, the function given by $f(x) = \begin{cases} x^2, & x < 3 \\ 6x - 9, & x \geq 3 \end{cases}$ is

(A) undefined.

(B) continuous but not differentiable.

(C) differentiable but not continuous.

(D) neither continuous nor differentiable.

(E) both continuous and differentiable.