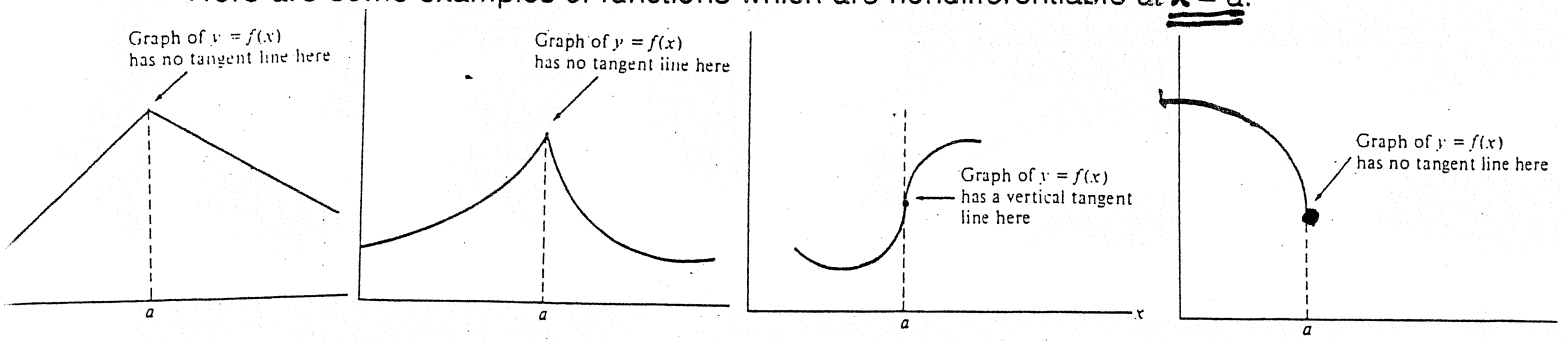
NOTES

DIFFERENTIABILITY AND CONTINUITY

A function is differentiable at a point if you can take the derivative at that point. That means you can draw one unique tangent which has a slope at that point.

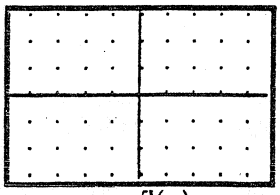
Here are some examples of functions which are nondifferentiable at **x** = a.



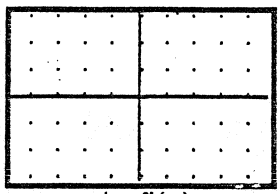
a. b. c. d.

1. How does that relate to continuity? Which of the functions above are continuous at x = a?

Sketch the derivative of functions a and b.

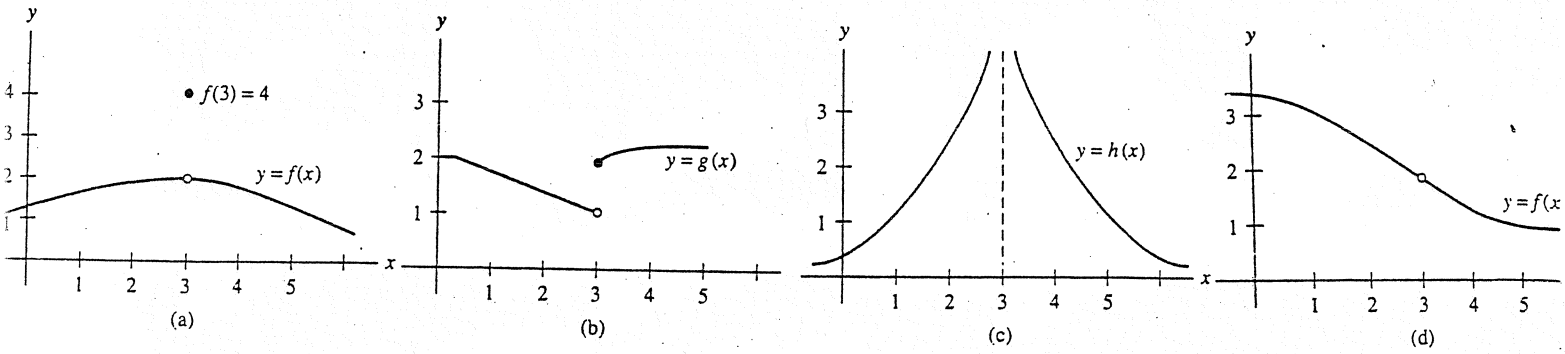


a. f'(x)



b. f'(x)

2. Which of the functions below are continuous at x = 3?
Which are differentiable at x = 3?

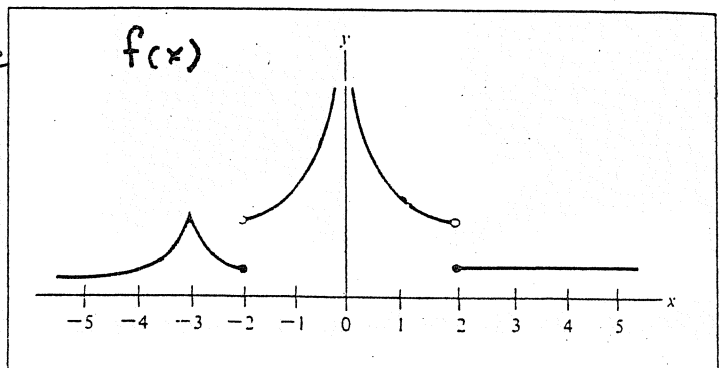


NC if it is not continuous

3. For f(x) write **C** if it is continuous and
D if it is differentaible
ND if it is not differentiable
for these values of x:

a. x = 0 b. x = .001 c. x = -3

d. x = 3 e. x = -2 f. x = 2



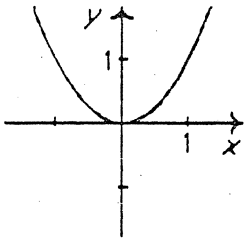
4. Is it possible for a function to be continuous at a point and not differentiable?

Is is possible for a function to be differentiable at a point and not be continuous?

5. What is the relationship between continuous and differentiable?

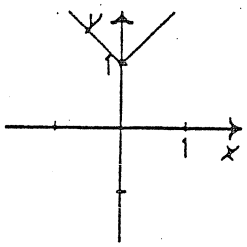
6. What point do you suspect of being a point of discontinuity of the derivative of each of these graphs?

a.



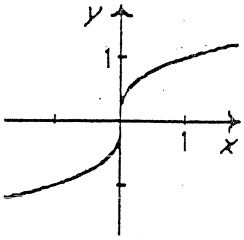
$f(x) = x^2$

b.



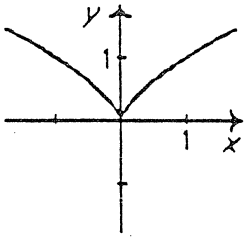
$f(x) = |x| + 1$

c.



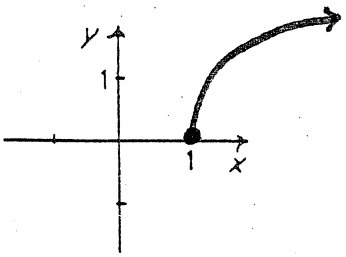
$f(x) = x^{1/3}$

d.



$f(x) = x^{2/3}$

e.



$f(x) = \sqrt{x-1}$

x-coordinates of points of discontinuity of

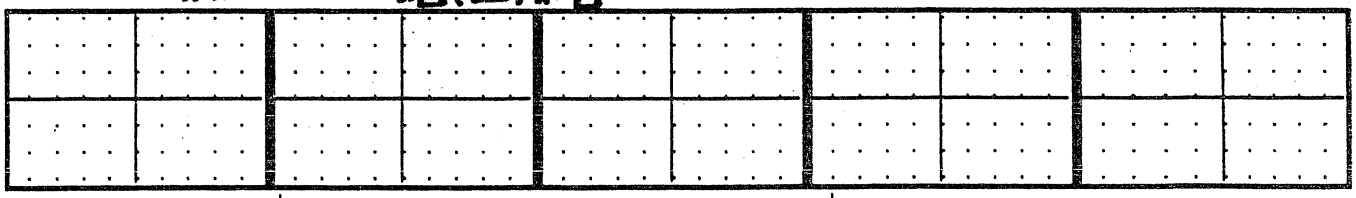
a. _____ **b.** _____ **c.** _____ **d.** _____ **e.** _____

7. Use your calculator to sketch the derivative of each and see if you were correct.

Y_1 = your function Y_2 = nDeriv(Y_1,x,x) (found in MATH 8)

older → $Y_2 = \frac{d}{d\square}(\square)_{x=\square}$

newer →



a. b. c. looks like $y =$ ____ d. looks like $y =$ ____ e. looks like $y =$ ____

8. Find the derivative of each of the functions in problem 6 and see if the mathematics supports your findings. What is the domain of the derivative of each function?

a. $y' =$ _____ b. $y' =$ _____ c. $y' =$ _____ d. $y' =$ _____ e. $y' =$ _____

D: _____ D: _____ D: _____ D: _____ D: _____