Math 1431, Section 17699

EMCF 3 (10 points)

Due 2/10 at 11:59pm

Instructions:

- Submit this assignment at http://www.casa.uh.edu under "EMCF" and choose EMCF 3.

D 1. $\lim_{x\to 0}\frac{\tan(5x)}{x}=$

a. -1
b. 0
c. $\frac{1}{5}$
d. 1
e. DNE
f. None of these.

$$\lim_{x\to 0}\frac{\tan(5x)}{x}=\lim_{x\to 0}\frac{\frac{\sin(5x)}{\cos(5x)}}{x}=\lim_{x\to 0}\frac{5}{5}\frac{\sin(5x)}{x}\cdot\frac{1}{\cos(5x)}$$

$$=\lim_{x\to 0}\frac{\sin(5x)}{5x}\cdot\frac{5}{\cos(5x)}$$

$$=1\cdot\frac{5}{1}=5$$

C 2. $\lim_{r\to 0}\frac{r}{\sin(r)}=$

a. -1
b. 0
c. 1
d. 2
e. DNE
f. None of these.

$$\lim_{r\to 0}\frac{1}{\frac{\sin(r)}{r}}=\frac{1}{1}=1.$$

D 3. $\lim_{u\to 0}\frac{\sin(4u)}{u\cos(u)}=$

a. -1
b. 0
c. 1
d. 4
e. DNE
f. None of these.

$$\lim_{u\to 0}\frac{4}{4}\cdot\frac{\sin(4u)}{u\cos(u)}$$

$$=\lim_{u\to 0}\frac{\sin(4u)}{4u}\cdot\frac{4}{\cos(u)}$$

$$=1\cdot\frac{4}{1}=4$$

D 4. $\lim_{x\to 0}\frac{\tan(5x)}{x}=$

a. 0
b. $1/5$
c. 1
d. 5
e. DNE
f. None of these.

$$\lim_{x\to 0}\frac{\frac{\sin(5x)}{\cos(5x)}}{x}=\lim_{x\to 0}\frac{5}{5}\frac{\sin(5x)}{5\cdot x}\cdot\frac{1}{\cos(5x)}$$

$$=\lim_{x\to 0}\frac{\sin(5x)}{5x}\cdot\frac{5}{\cos(5x)}$$

$$=1\cdot\frac{5}{1}=5$$

D 5. If $f(3)=2$ and $f'(3)=-1$, find an equation of the tangent line when $x=3$

a. $y-3=2(x+1)$
b. $y-2=3(x+1)$
c. $y+1=2(x-3)$
d. $y-2=-1(x-3)$
e. $y-2=2(x-3)$
f. None of these.

$f(3)=2 \Rightarrow$ the line goes through $(3,2)$

$f'(3)=-1 \Rightarrow$ the slope of the line is -1

$\Rightarrow (y-2)=-1(x-3)$

$\Rightarrow$ D

C 6. If $f(x)=-x^2+2x$, which of the following will calculate the derivative of $f(x)$?

a. $\lim_{h\to 0}\frac{(-x^2+2x+h)-(-x^2+2x)}{h}$
b. $\lim_{x\to 0}\frac{(-x^2+2x+h)-(-x^2+2x)}{h}$
c. $\lim_{x\to 0}\frac{(-(x+h)^2+2(x+h))-(-x^2+2x)}{h}$
d. $\lim_{h\to 0}\frac{(-(x+h)^2+2(x+h)+h)-(-x^2+2x)}{h}$
e. $\lim_{h\to 0}\frac{(-(x+h)^2+2(x+h))-(-x^2+2x)}{h}$
f. None of these.

formula for derivative: $\lim_{h\to 0}\frac{f(x+h)-f(x)}{h}$

$$=\lim_{h\to 0}\frac{\left[-(x+h)^2+2(x+h)\right]-(-x^2+2x)}{h}$$

C 7. Let $f(x)=x^2-2x$. Give the value of $\lim_{h\to 0}\frac{f(1+h)-f(1)}{h}$

a. -2
b. -1
c. 0
d. DNE
e. 2
f. None of these

$$=\lim_{h\to 0}\frac{\left[(1+h)^2-2(1+h)\right]-[1-2]}{h}$$

$$=\lim_{h\to 0}\frac{h^2+2h+1-2-2h+1}{h}$$

$$=\lim_{h\to 0}\frac{h^2}{h}=\lim_{h\to 0}h=0$$

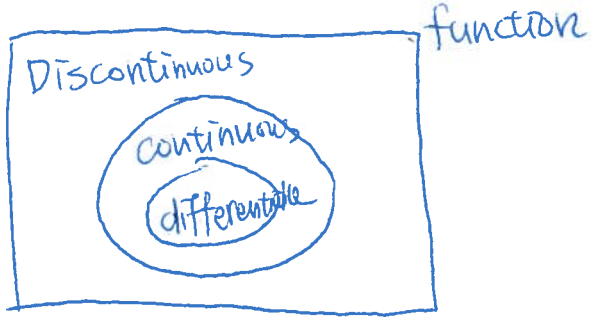
B 8. Give the slope of the tangent line to the graph of $f(x) = x^2 - 3x$ at the point $x = 1$

a. 1
b. -1
c. -2
d. DNE
e. 2
f. None of these

$f'(x) = 2x - 3$, $f'(1) = -1 \Rightarrow$ slope.

A 9. Differentiability implies continuity.

a. True
b. False

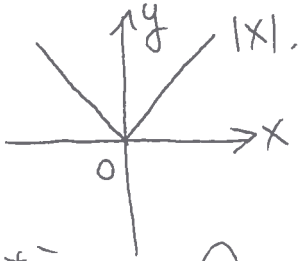


B 10. Continuity implies differentiability.

a. True
b. False

Counterexample:

$f(x) = |x|$



f is continuous @ $x = 0$

but is NOT differentiable @ $x = 0$.