MIDTERM FRIDAY @ 6PM GEOG 200 (I)

IMPORTANT SURVEY ON PIAZZA

STUDENT GUIDE

HTTP://BLOGS.UBC.CA/MATHSTUDENTGUIDE104

Q $\frac{d}{dx}(e^7)$

(A) $= 7e^6$

(B) $= e^7$

(C) $= 0$

Q IF $f(1)=1$ & $f'(1)=3$ THEN

$\frac{d}{dx}\left(\frac{f(x)}{x^2}\right)$ AT $x=1$ EQUALS

(A) 1

(B) 3/2

(C) -1

T/F BY CONSTANT RULE $\frac{d}{dx}(cf(x)) = c\frac{d}{dx}(f(x))$

BY PRODUCT RULE

$$\frac{d}{dx}(cf(x)) = \left(\frac{d}{dx}(c)\right)\cdot f(x) + c\cdot\frac{d}{dx}(f(x))$$

& BOTH RULES GIVE SAME RESULT,

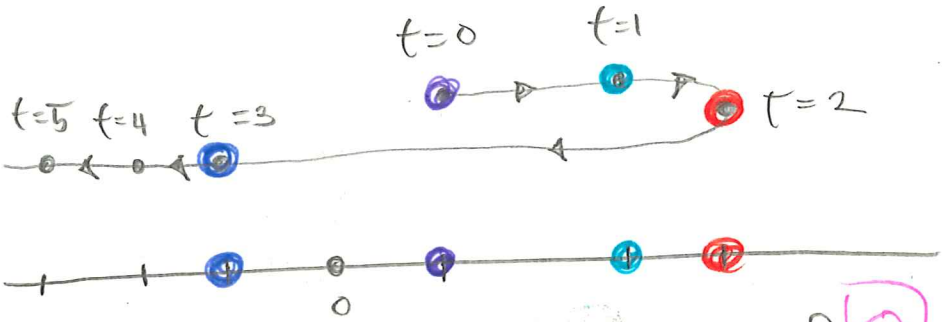
(II)

CONSIDER PARTICLE MOVING ON A STRAIGHT LINE WITH A CHOSEN

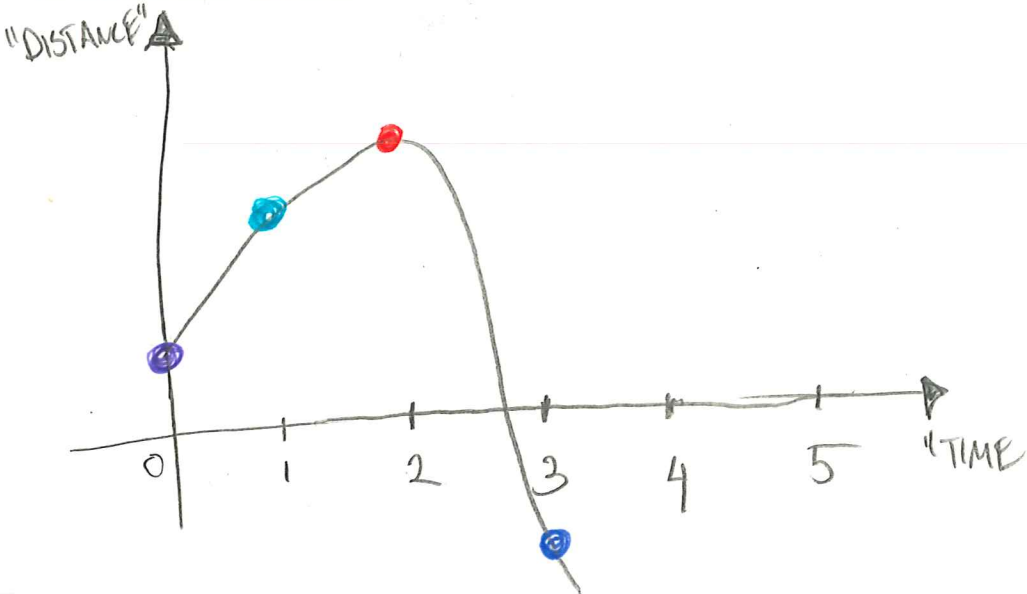
↳ ORIGIN O

↳ POSITIVE DIRECTION

LET $S(t)$ DENOTE DISTANCE OF PARTICLE FROM O AT TIME t



GRAPH $S(t)$ HOW DOES IT LOOK? Q



WHAT DOES

$\frac{s(a+h)-s(a)}{h}$ REPRESENT FOR

FIXED a & $h > 0$?

AVERAGE VELOCITY DURING INTERVAL

$[a, a+h]$ (DEPENDS ON h)

WHAT DOES

$\lim_{h \to 0} \frac{s(a+h)-s(a)}{h}$ REPRESENT

FOR FIXED a ?

- INSTANTANEOUS VELOCITY (INDEP OF h)
- THEORETICAL CONCEPT LIMIT OF AVERAGE VELOCITIES
- RATE OF CHANGE OF POSITION

Q CAN YOU THINK OF OTHER EXAMPLES WHERE DERIVATIVES WOULD COME INTO PLAY ?

RECALL BUSINESS PROBLEM

SETUP:

$C(x)$ = PRODUCTION COST FOR x ITEMS

THINGS YOU MIGHT WORRY ABOUT:

↳ AVERAGE COST $\bar{C}(x) = \frac{C(x)}{x}$

HOW DOES THIS QUANTITY CHANGE WITH x?

↳ AVERAGE COST OF PRODUCING Δx MORE UNITS GIVEN THAT HAVE ALREADY PRODUCED x UNITS

$$\frac{\Delta C}{\Delta x} = \frac{C(x+\Delta x) - C(x)}{\Delta x}$$

HOW MUCH WILL IT COST PER EXTRA UNIT TO INCREASE PRODUCTION FROM x TO $x + \Delta x$

TAKING IDEA FURTHER

(V)

DEFINE MARGINAL COST

$$MC(x) := C'(x) = \lim_{\Delta x \to 0} \frac{\Delta C}{\Delta x}$$

NOTICE USE Δx INSTEAD OF h WHY? Q

CAN'T EVER HAVE INCREASE OF < 1 UNIT ... SO WHY DO WE USE DERIVATIVE INSTEAD OF AVERAGE? Q

WHAT OTHER FUNCTIONS DID WE HAVE? Q

AVERAGE REVENUE $\bar{R}(x) = \frac{R(x)}{x}$

MARGINAL REVENUE $MR(x) = R'(x)$

AVERAGE PROFIT $\bar{P}(x) = \frac{P(x)}{x}$

MARGWAL PROFIT $MP(x) = P'(x)$

↳ (AT THE EDGE)

EXAMPLE IF $C(x) = 6x^2 + 2x + 10$

(A) FIND $MC(x)$

(B) FIND $MC(10)$ & $C(10)$

(C) USE THIS DATA TO ESTIMATE $C(11)$

(A) $C'(x) = 12x + 2$

(B) $MC(10) = 120 + 2 = 122$

$C(10) = 600 + 20 + 10 = 630$

(C) $MC(10) \approx C(11) - C(10)$

$\Rightarrow C(11) \approx C(10) + MC(10) = 752$

THINK OF $\lim_{\Delta x \to 0} \frac{C(x + \Delta x) - C(x)}{\Delta x}$

AS STOPPING AT SMALLEST POSSIBLE VALUE OF $\Delta x = 1$

(THIS IS DONE IN CALC-FREE ECON)

VII

EX) SAY DEMAND DECREASES VERY QUICKLY $q(p) = 1000e^{-p}$

(A) FIND $R(p)$ Q

$$R(p) = q \cdot p = 1000pe^{-p}$$

(B) FIND MARGINAL REVENUE WITH RESPECT TO PRICE Q

$$MR(p) = R'(p) = 1000\left(e^{-p} - pe^{-p}\right)$$
$$= 1000e^{-p}(1-p)$$

(C) IS THERE A PRICE FOR WHICH MARGINAL PROFIT IS ZERO? (MAXIMIZED) Q

$MR(p)$ IS CTS $\Rightarrow$ CAN USE IVT

$$MR(0) = 1000e^{0}(1-0) = 1000 > 0$$

$$MR(10) = 1000e^{-10}(1-10) < 0$$

$\therefore$ OR COULD HAVE GUESSED $p=1$

WHAT ABOUT CRAZY EQUATION ????