MATH 10A Week 5

§2.4

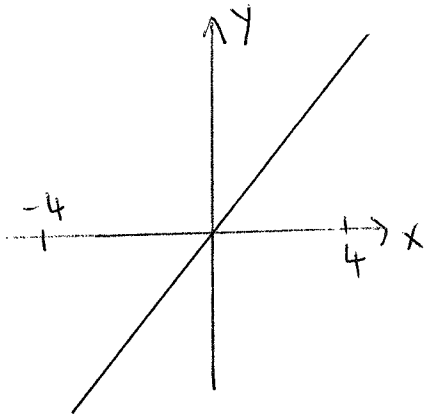
Q20a) As the cup of coffee cools, the temperature decreases, so $f'(t)$ is negative

b) Since $f'(t) = \frac{dH}{dt}$, the units are degrees Celsius per minutes. The quantity $f'(20)$ represents the rate at which the coffee is cooling, in degrees per minutes, 20 minutes after the cup is put on the counter.

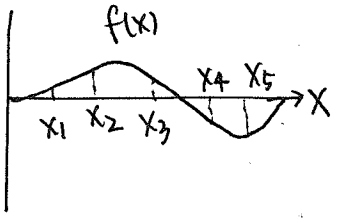
§2.5 2nd Derivative

f'' + + (concave up) − − (concave down)

Q18



Q27 At which marked point, the following statement is true?



a) $f(x)<0$

b) $f'(x)<0$

c) $f(x)$ is decreasing

d) $f'(x)$ is decreasing

e) Slope of $f(x)$ is positive

f) Slope of $f(x)$ is increasing

Ans: a) X_4, X_5

b) X_3, X_4

c) X_3, X_4

d) X_2, X_3

e) X_1, X_2, X_5

f) X_1, X_4, X_5

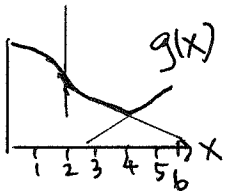
§2.6 Differentiability

$$f \text{ is diff at } x \Leftrightarrow \lim_{h\to 0} \frac{f(x+h)-f(x)}{h} \text{ exists}$$

Q2) list the x value for which the function appears to be

a) NOT continuous

b) NOT differentiable



a) g is continuous for $0 \le x \le 6$

b) $x=2$ for the tangent is vertical

$x=4$ for it is a corner.

Q6) Check diff at $x=0$

$$f(x) = \begin{cases} x\sin\left(\frac{1}{x}\right)+x & \text{for } x \neq 0 \\ 0 & \text{for } x = 0 \end{cases}$$

ANS: NOT differentiable

$$\frac{f(0+h)-f(0)}{h} = \frac{h\sin\left(\frac{1}{h}\right)+h}{h} = \sin\left(\frac{1}{h}\right)+1$$

limit does NOT exist when $h \to 0$

Q7 Check diff. at $x=0$

$$f(x)=\begin{cases} x^2\sin\left(\frac{1}{x}\right) & x\neq 0 \\ 0 & x=0 \end{cases}$$

Ans: $\lim_{h\to 0} \frac{f(0+h)-f(0)}{h}$

$= \lim_{h\to 0} \frac{h^2\sin\left(\frac{1}{h}\right)}{h}$

$= \lim_{h\to 0} h\sin\left(\frac{1}{h}\right)$

$= 0$

Limit exists $\Rightarrow$ f is differentiable at $x=0$