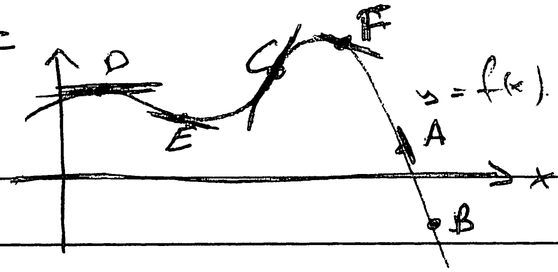
chapter 2.2

10.



A: derivative is negative

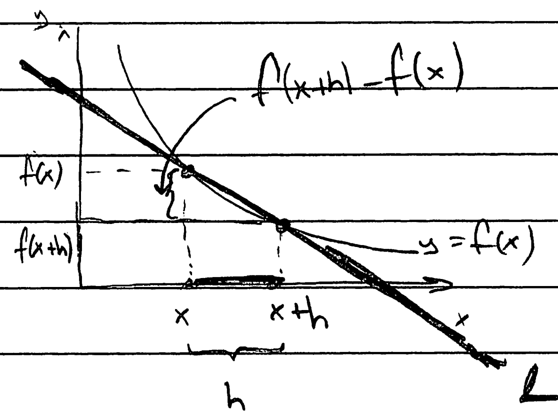
B: f is negative

C: derivative is largest

D: derivative is zero

E-F: tangent lines have same slope!

19.



$\frac{f(x+h)-f(x)}{h}$ is slope of line L.

Ex: $f(x) = x^3+5$

$$f'(1) = \lim_{h\to 0} \frac{f(1+h) - f(1)}{h}$$

$$= \lim_{h\to 0} \frac{(1+h)^3 + \cancel{5} - (1 + \cancel{5})}{h}$$

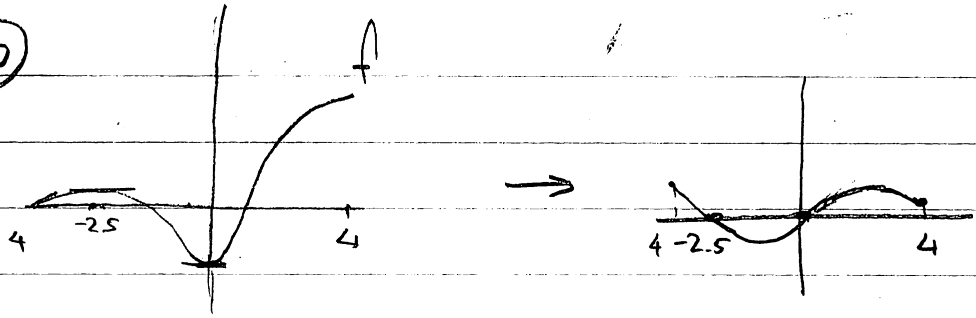
$$= \lim_{h\to 0} \frac{\cancel{1} + 3h^2 + 3h + h^3 - \cancel{1}}{h}$$

$$= \lim_{h\to 0} 3h + 3 + h^2$$

$$f'(1) = 3.$$

Chapter 2.3

(10)



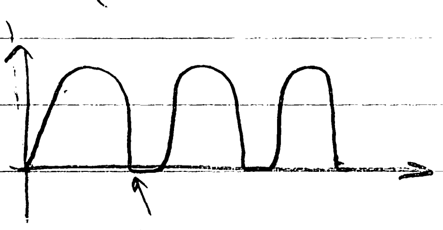
(16) $m(x)=\frac{1}{x+1}$ $\quad m'(x)=\lim_{h\to 0}\frac{m(x+h)-m(x)}{h}$

So $m'(x)=\lim_{h\to 0}\frac{\frac{1}{x+h+1}-\frac{1}{x+1}}{h} = \lim_{h\to 0}\frac{\cancel{x+1}-\cancel{x}-h-\cancel{1}}{(x+h+1)(x+1)}\cdot\frac{1}{h}$

$=\lim_{h\to 0}\frac{-\cancel{h}}{(x+\underset{0}{\cancel{h}}+1)(x+1)}\cdot\frac{1}{\cancel{h}}$

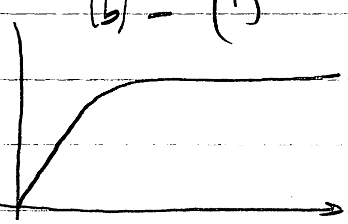
$=\frac{-1}{(x+1)^2}$

(37) (a) - (ii) No traffic $\Leftrightarrow$ from start it will speed up and stop at the bus stops.



$f'(x)$ = speed increases first, then decreases and stops

(b) - (i)



f' will increase and go with max speed.

chapter 2.3

(37) (c) - (iii) heavy traffic conditions

$\Rightarrow$ speed will change abruptly

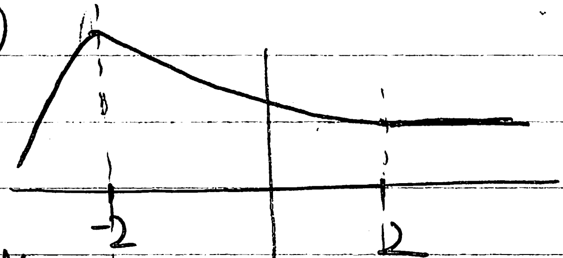
(40) (a) $f(x_3)$ greatest

(b) $f(x_4)$ least

(c) $f'(x_5)$ greatest

(d) $f'(x_3)$ least

(45)



$f'>0$ $f'<0$ $f'=0$

chapter 2.4

(16) $D=f(w)$

a) $f(140)=120$ means A patient that weighs 140 pounds should take 120 mg of given medicine

$$f'(140)=3=\lim_{h\to 0}\frac{f(140+h)-f(140)}{h}$$

= unit of f' is mg/lbs

So $f'(140)=3$ mg/lbs means

at W=140 1 lbs change in weight will change the dose 3 mgs.

i.e. if W=141 $f(141)\approx 120+1=121$.

or in general $\lim_{h \to 0} \frac{f(140+h) - f(140)}{h} = f'(140) = 3$

if $h \approx 0$ $\frac{f(140+h) - f(140)}{h} \approx 3$

$f(140+h) = f(140) + 3h$

$= 120 + 3h$

for any $h \approx 0$

$f(140+h) = 120 + 3h$

b) So from above $f(145) = f(140+5) = 120 + 15 = \underline{\underline{135}}$

(21) $g(v)$ = fuel efficiency miles/gallon

v = miles/hr

$g'(v) = \lim_{h \to 0} \frac{g(v+h) - g(v)}{h} = \frac{\text{unit of } g}{\text{unit of } h} = \frac{\text{miles/gallon}}{\text{miles/hr}}$

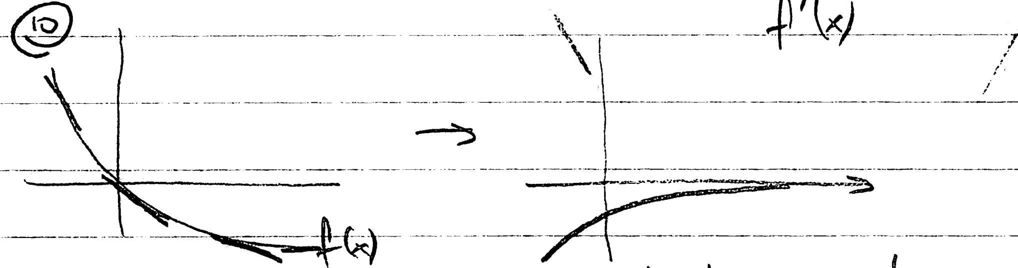
= hr/gallon or mpg/mph

$g'(55) = -0.54 < 0$ means: at $v = 55$

fuel efficiency is decreasing

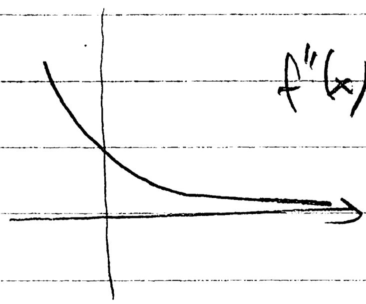
Section 2.5

10



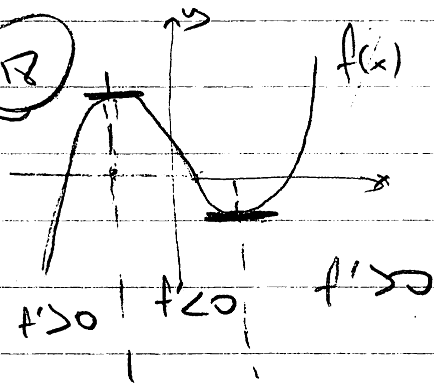
$f(x)$ is decreasing: $f'<0$

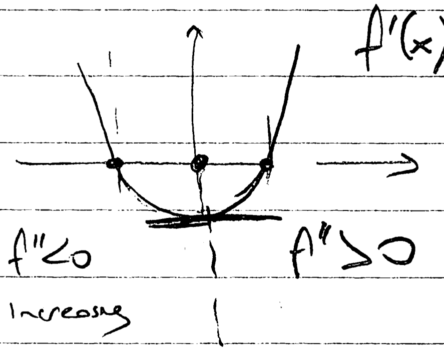
slope of tangent line increases as $x \to \infty$ and approaches 0.

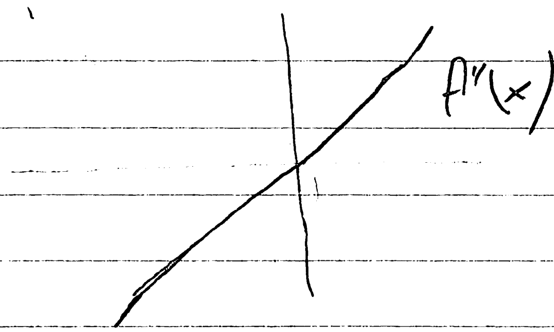


f' is increasing $f''>0$

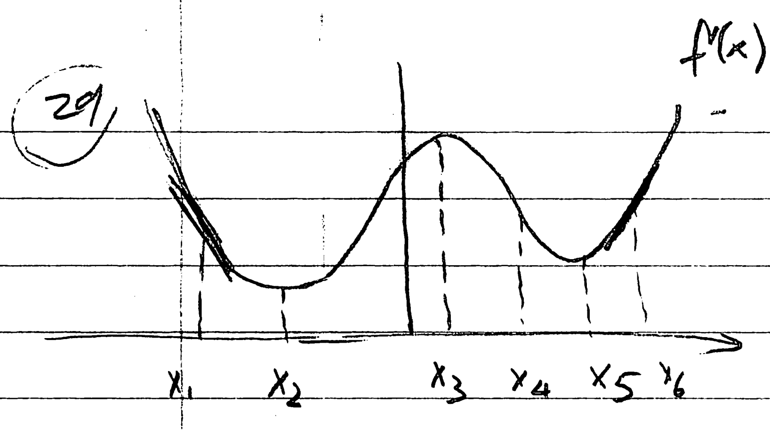
12







29



Notice $f' > 0$
So f is increasing

a) $f(x_6)$ greatest
b) $f(x_1)$ least
c) $f'(x_3)$ greatest
d) $f'(x_2)$ least
e) $f''(x_6)$ greatest
f) $f''(x_1)$ least

$f''(x) = $ Slope of f'