

## Chapter #3 (3.1)

Final exam review sheet q#4(a)

find the difference quotient  $\frac{f(x+h)-f(x)}{h}$

(assume  $h \neq 0$ ) for:

a)  $f(x) = x^2 + 5x + 2$

Solution:-

So first we have to find  $f(x+h)$

$$\begin{aligned} f(x+h) &= (x+h)^2 + 5(x+h) + 2 \\ &= (x^2 + 2xh + h^2) + 5x + 5h + 2 \\ &= x^2 + 2xh + h^2 + 5x + 5h + 2 \end{aligned}$$

Now we have to subtract  $f(x)$   
from  $f(x+h)$

$$\begin{aligned} f(x+h) - f(x) &= x^2 + 2xh + h^2 + 5x + 5h + 2 - (x^2 + 5x + 2) \\ &= \cancel{x^2} + 2xh + h^2 + 5\cancel{x} + 5h + \cancel{2} - \cancel{x^2} - 5\cancel{x} - \cancel{2} \\ &= 2xh + h^2 + 5h \end{aligned}$$

With this we obtain

$$\begin{aligned}\frac{f(x+h)-f(x)}{h} &= \frac{2xh+h^2+5h}{h} \\ &= \frac{h(2x+h+5)}{h}\end{aligned}$$

Ans:

$$\frac{f(x+h)-f(x)}{h} = 2x+h+5$$