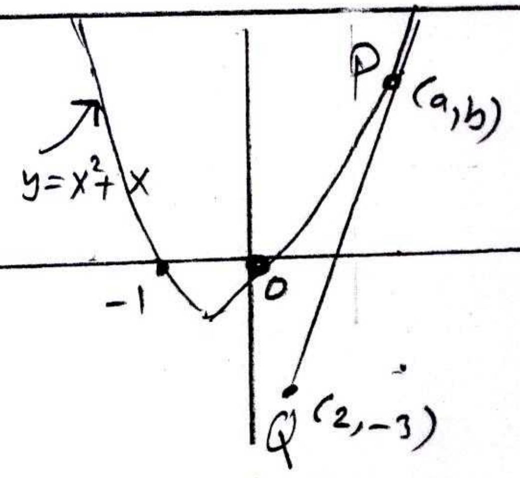
(3.1) H.w #40, 50, and 60 p.191

#40 p.191 $y = (1+2x)^2 = 1+4x+4x^2 \Rightarrow y' = 4+8x \Rightarrow$

$y'|_{(1,9)} = 4+8 = 12 =$ the slope of the tangent at $(1,9) \Rightarrow$

The required eqn: $y-9 = 12(x-1) \Rightarrow \boxed{y = 12x-3}$

#50 p.191 Let $P(a,b)$ be one of the tangency points $\Rightarrow$ The coordinates of P satisfies $y = x^2+x \Rightarrow \boxed{b = a^2+a}$ (i)



The slope of the tangent at P is

$y'|_{(a,b)} = (2x+1)|_{(a,b)} = 2a+1$

It is also equal to the slope of the line through P & Q

$= \dfrac{b+3}{a-2} \Rightarrow \dfrac{b+3}{a-2} = 2a+1 \Rightarrow b+3 = 2a^2-3a-2$

$\Rightarrow \boxed{b = 2a^2-3a-5}$ (ii). From (i) & (ii) $\Rightarrow$

$2a^2-3a-5 = a^2+a \Rightarrow a^2-4a-5 = (a-5)(a+1) = 0 \Rightarrow$

$\boxed{a=-1 \Rightarrow b=0}$ or $\boxed{a=5 \Rightarrow b=30} \Rightarrow$

The tangency points are $(-1,0)$, $(5,30) \Rightarrow$

The required eqns are: $(y-0) = -(x+1) \Rightarrow \boxed{y=-x-1}$

and $y-30 = 11(x-5) \Rightarrow \boxed{y = 11x-25}$

#60 p.191 f is continuous if $\lim_{x\to 2^-} f(x) = \lim_{x\to 2^+} f(x) = f(2) \Rightarrow$

$\boxed{4 = 2m+b}$ & diff. if $f'_{-2} = f'_{+2} \Rightarrow (2x)_2 = m \Rightarrow \boxed{m=4}$

$\Rightarrow b = 4-2m \Rightarrow \boxed{b=-4}$