

Math 1121

Homework #7

#12, #27c

#12  $s(t) = 5t^2 - 2t - 7$  at  $t = 3$

$$\begin{aligned}\lim_{h \rightarrow 0} \frac{f(a+h) - f(a)}{h} &= \lim_{h \rightarrow 0} \frac{s(3+h) - s(3)}{h} \\ &= \lim_{h \rightarrow 0} \frac{5(3+h)^2 - 2(3+h) - 7 - (5 \cdot 3^2 - 2 \cdot 3 - 7)}{h} \\ &= \lim_{h \rightarrow 0} \frac{5(9+6h+h^2) - 6 - 2h - 7 - (32)}{h} \\ &= \lim_{h \rightarrow 0} \frac{45 + 30h + 5h^2 - 6 - 2h - 7 - 32}{h} \\ &= \lim_{h \rightarrow 0} \frac{5h^2 + 28h}{h} = \lim_{h \rightarrow 0} \frac{\cancel{h}(5h+28)}{\cancel{h}} = \lim_{h \rightarrow 0} 5h + 28 \\ &= 5 \cdot 0 + 28 = \underline{28}\end{aligned}$$

#27c  $N(p) = 80 - 5p^2$  at  $p = 3$

$$\begin{aligned}\lim_{h \rightarrow 0} \frac{N(3+h) - N(3)}{h} &= \lim_{h \rightarrow 0} \frac{80 - 5(3+h)^2 - (80 - 5 \cdot 3^2)}{h} \\ &= \lim_{h \rightarrow 0} \frac{80 - 5(9+6h+h^2) - (35)}{h} = \lim_{h \rightarrow 0} \frac{80 - 45 - 30h - 5h^2 - 35}{h} \\ &= \lim_{h \rightarrow 0} \frac{-30h - 5h^2}{h} = \lim_{h \rightarrow 0} \frac{\cancel{h}(-30 - 5h)}{\cancel{h}} = \lim_{h \rightarrow 0} -30 - 5h \\ &= -30 - 5 \cdot 0 = \boxed{-30}\end{aligned}$$