1)

a) $N(x) = f(x)\,g(x)$

$N'(x) = f'(x)\,g(x) + g'(x)\,f(x)$

$N'(-1) = f'(-1)\,g(-1) + g'(-1)\,f(-1)$

$f(-1) = 6$

$f'(-1) = -2$

$g(-1) = (-4)^{1/3}$

$g'(x) = \frac{1}{3}(x^2+5x)^{-2/3}(2x+5)$

$g'(-1) = \frac{1}{3}(-4)^{-2/3}(3)$

b) $P(x) = \frac{g(x)}{5f(x)}$

$P'(x) = \frac{5f(x)g'(x) - 5g(x)f'(x)}{[5f(x)]^2}$

$P'(4) = \frac{5f(4)g'(4) - 5g(4)f'(4)}{[5f(4)]^2}$

$f(4) = 3$

$f'(4) = \frac{1}{3}$

$g(4) = (36)^{1/3}$

$g'(4) = \frac{1}{3}(36)^{-2/3}(13)$

* NOTE: You could have used a calculator to solve parts (a) & (b)

c) $h(x) = 7\cos x + x^3$

$h'(x) = -7\sin x + 3x^2$

$f'(x) = -2$

$-7\sin x + 3x^2 = -2$

$x = 0.342$

2) a) $RDC_{avg} = \frac{f(5)-f(-5)}{5-(-5)}$ $\quad f'(x)=\frac{3}{5}$ twice

$= \frac{9-3}{10} = \frac{3}{5}$

b) $f(2)=6 \quad f'(2)=-2$

$y-6=-2(x-2)$

c) $\lim_{x\to -1} \frac{f(x)-f(-1)}{x-(-1)} = f'(-1) = 4$

$\lim_{x\to 3} \frac{f(x)-f(3)}{x-3} = f'(3)$ is undefined

$\lim_{x\to 3^-} \frac{f(x)-f(3)}{x-3} \neq \lim_{x\to 3^+} \frac{f(x)-f(3)}{x-3}$

d) $g(x) = f(x)\cdot \ln x$

$g'(x) = f(x)\cdot\frac{1}{x} + \ln x \cdot f'(x)$

$g'(4) = f(4)\cdot\frac{1}{4} + \ln 4 \cdot f'(4)$

$= \frac{6}{4} + 3\ln 4$

3) a) $ROC_{avg} = \frac{A(90)-A(45)}{90-45} = \frac{405-190}{45}$ autos/min

b) $A'(95) = \lim_{h\to 0} \frac{A(95+h)-A(95)}{h}$

or

$$\lim_{t\to 95} \frac{A(t)-A(95)}{t-95}$$

$$A'(95) \approx \frac{A(100)-A(90)}{100-90} = \frac{205}{10} = 20.5$$

c) $A(t) = 400$ in $(70,90)$

since $A(70) = 250 < 400$

&

$A(90) = 405 > 400$

Then by IVT $A(t) = 400$.

d) $f(t) = 227t^2 + 89t$

$f'(t) = 2(227)t + 89$

$f'(10) = 20(227) + 89$