SOLUTION #5 (8 AM)

Solution 1. (1) $\frac{d}{dx}$*:* $2x + \frac{dy}{dx} = 3x^2 + 2y\frac{dy}{dx}$ *(1pt)*

$\Longrightarrow (1-2y)\frac{dy}{dx} = 3x^2 - 2x \Rightarrow \frac{dy}{dx} = \frac{3x^2-2x}{1-2y}$ *(1pt)*

(2) $\frac{d}{dx}$*:* $y + x\frac{dy}{dx} + 2\frac{dy}{dx} = 2x$ *(1pt)*

$\Longrightarrow (2+x)\frac{dy}{dx} = 2x - y \Rightarrow \frac{dy}{dx} = \frac{2x-y}{2+x}$ *(1pt)*

Solution 2. (1) $f'(x) = \frac{x^2+3-x(2x)}{(x^2+3)^2} = \frac{3-x^2}{(x^2+3)^2}$

Since $x^2+3>0$, $f'(x)$ *always exists.*

$f'(x) = 0 \Rightarrow 3 - x^2 = 0 \Rightarrow x = \pm\sqrt{3}$*(2pts)*

(2) *Increasing intervals:* $(-\sqrt{3}, \sqrt{3})$.*(1pt)*

Decreasing intervals: $(-\infty, -\sqrt{3}) \cup (\sqrt{3}, \infty)$.*(1pt)*

(3) $x = -\sqrt{3}$ *gives the relative minumum;(1pt)*

$x = \sqrt{3}$ *gives the relative maximum.(1pt)*