191-t2sol-DX01

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(1) a) $f(x) = 2x^{-1/3}$

$f'(x) = -\frac{2}{3} x^{-4/3}$

b) $f'(x) = 6(x^2+9)^5 (2x)$

$= 12x(x^2+9)^5$

c) $f(x) = (4-2x)^{1/2}$

$f'(x) = \frac{1}{2}(4-2x)^{-1/2}(-2)$

$= \frac{-1}{\sqrt{4-2x}}$

(2) $x(y^3) + x^3 - y^2 + 7 = 0$

Take $\frac{d}{dx}$:

$x\left[3y^2 \frac{dy}{dx}\right] + y^3 + 3x^2 - 2y\frac{dy}{dx} = 0$

$3xy^2 \frac{dy}{dx} - 2y\frac{dy}{dx} = -y^3 - 3x^2$

$$(3xy^2 - 2y)\frac{dy}{dx} = -y^3 - 3x^2$$

$$\frac{dy}{dx} = \frac{-y^3 - 3x^2}{3xy^2 - 2y}$$

(3) $v_x = 1 - 3t^2$ $\quad v_y = 6t$

$a_x = -6t$ $\quad a_y = 6$

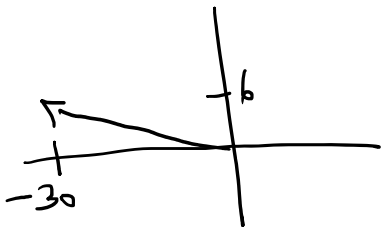
@ $t = 5$: $\quad a_x = -30$ $\quad a_y = 6$

magnitude of acceleration $a = \sqrt{a_x^2 + a_y^2}$

$$= \sqrt{(-30)^2 + 6^2}$$

$$\approx 30.6 \text{ m/s}^2$$

direction $\theta = \tan^{-1}\left(\frac{a_y}{a_x}\right)$ $(+180^\circ ?)$



$$\theta = \tan^{-1}\left(\frac{6}{-30}\right) + 180^\circ$$

$\approx 168.7^\circ$

(4) $p = V^{-1.4}$

Take $\frac{d}{dt}$: $\frac{dp}{dt} = \frac{dp}{dV} \cdot \frac{dV}{dt}$

$\frac{dp}{dt} = -1.4V^{-2.4} \frac{dV}{dt}$

$= -1.4(20)^{-2.4}(120)$

$\approx -0.13 \frac{kPa}{s}$

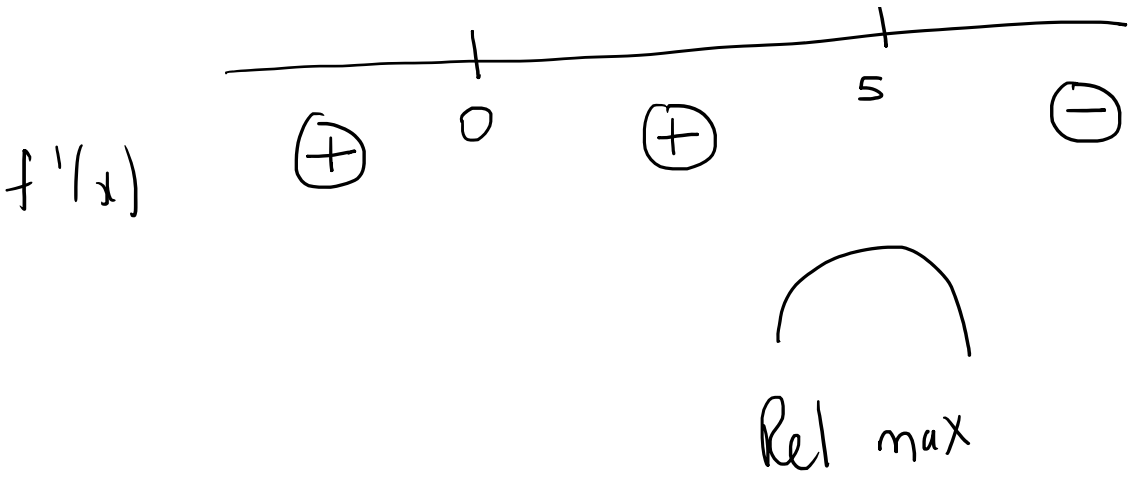
(5) $f(x) = 6x^5 - x^6$

$f'(x) = 30x^4 - 6x^5$

$= 6x^4(5 - x)$

$= 0$

Critical Points: $x = 0, 5$



Relative maximum at $x = 5$

$y = 6(5^5) - 5^6 = 3125$