1\. a) $\lim_{x \to 0} \dfrac{\tan x - x}{x^2}$

$= \lim_{x \to 0} \dfrac{\sec^2 x - 1}{2x}$

$= \lim_{x \to 0} \dfrac{\cancel{2} \sec^2 x \tan x}{\cancel{2}}$

$= \lim_{x \to 0} \sec^2 x \tan x$

$= 0$

1\. b) when $x \to -\infty$, $x < 0$

$\therefore |x| = -x$

$\lim_{x \to -\infty} \dfrac{3x^3 + 5x + 1}{5x^3 + 2x^2 - 9}$

$= \lim_{x \to -\infty} \dfrac{3\cancel{x^3}}{5\cancel{x^3}}$

$= 3/5$

2\. a) $y = \ln \left[\dfrac{\sqrt[3]{2x+1}}{(2x-1)(x+3)} \right]$

$y = \ln(\sqrt[3]{2x+1}) - \ln(2x-1) - \ln(x+3)$

$= \frac{1}{3} \ln(2x+1) - \ln(2x-1) - \ln(x+3)$

$= \dfrac{2}{3(2x+1)} - \dfrac{2}{2x-1} - \dfrac{1}{x+3}$

$$e^x y^2 + y^5 = 5$$

$$e^x 2yy' + e^x y^2 + 5y^4 y' = 0$$

$$y'[e^x 2y + 5y^4] = -e^x y^2$$

$$y' = \frac{-e^x y^2}{e^x 2y + 5y^4}$$

$$= \frac{-ye^x}{2e^x + 5y^3}$$

3 $f(x) = 4x^3 - 6x^2 - 9x \quad [-1, 2]$

$f'(x) = 12x^2 - 12x - 9$

$f'(x) = 0$

$12x^2 - 12x - 9 = 0$

$4x^2 - 4x - 3 = 0$

$4x^2 - 6x + 2x - 3 = 0$

$2x(2x - 3) + 1(2x-3) = 0$

$(2x+1)(2x-3) = 0$

$2x + 1 = 0 \qquad 2x - 3 = 0$

$x = -1/2 \qquad x = 3/2$

$f(-1) = 4(-1)^3 - 6(-1)^2 - 9(-1) = -4 - 6 + 9 = -1$

$f(-1/2) = 2.5$

$f(3/2) = -13.5$

$f(2) = -10$

$\therefore$ abs min $= -13.5$ at $x = 3/2$

abs max $: 2.5$ at $x = -1/2$