1.) $f(x) = \sqrt[3]{6x^2 - x^3} = \left(6x^2 - x^3\right)^{\frac{1}{3}}$

$$f'(x) = \frac{1}{3}\left(6x^2 - x^3\right)^{-\frac{2}{3}} \cdot \left(12x - 3x^2\right) = \frac{\overset{4}{\cancel{12}}x - \cancel{3}x^2}{\cancel{3}\sqrt[3]{\left(6x^2 - x^3\right)^2}}$$

x	-2		0		4				9
f'		$-$		$+$		$-$		$+$	
f		$\searrow$		$\nearrow$		$\searrow$		$\nearrow$	

$f_{max} = f(4) = \sqrt[3]{32}$

$f_{min} = f(0) = f(6) = 0$

4.) $\int_2^\infty R(x)\,dx$, $R(x)=\dfrac{6x^4-5x^3+37x^2-35x+37}{x^5-x^4+8x^3-8x^2-9x+9}$

$$\int_2^\infty \frac{1}{x-1}dx+\int_2^\infty \frac{2}{(x-1)^2}dx+\int_2^\infty \frac{3}{x+1}dx+\int_2^\infty \frac{2x-1}{x^2+9}dx=$$

$$=\Big[\ln|x-1|\Big]_2^\infty+\Big[-\frac{2}{x-1}\Big]_2^\infty+\Big[3\ln|x+1|\Big]_2^\infty+\Big[\ln|x^2+9|-\frac{1}{3}\operatorname{arctg}\frac{x}{3}\Big]_2^\infty=$$

$$=[\infty-0]+[0+2]+[\infty-3\ln 3]+[\infty-\ln 13-\tfrac{1}{3}\operatorname{arctg}\tfrac{2}{3}]=$$

$$=\underline{\underline{\infty}}$$

$$\int_2^\infty \frac{2}{(x-1)^2}dx=\left|\begin{array}{r}(x-1)^2=t\\ 2(x-1)dx=dt\\ (x-1)=\sqrt{t}\\ x=\sqrt{t}+1\end{array}\right|=\int_2^\infty \frac{2}{t}\cdot\frac{1}{2\sqrt{t}}dt=\int_2^\infty t^{-1}\cdot t^{-\frac{1}{2}}dt=\int_2^\infty t^{-\frac{3}{2}}dt=*$$

$$*=\left[\frac{t^{-\frac{1}{2}}}{-\frac{1}{2}}\right]_2^\infty=\left[-\frac{2}{\sqrt{t}}\right]_2^\infty=\left[-\frac{2}{x-1}\right]_2^\infty$$

$$\int\frac{2x-1}{x^2+9}dx=\int\frac{2x}{x^2+9}dx-\int\frac{1}{x^2+9}dx=\ln|x^2+9|-\frac{1}{3}\operatorname{arctg}\frac{x}{3}$$

$$\int\frac{1}{x^2+9}dx=\int\frac{1}{x^2+3^2}dx=\frac{1}{3}\operatorname{arctg}\frac{x}{3}$$