5) find $\frac{dy}{dx}$ $\quad y = \sqrt[7]{(x^2-\ln x)^x}$

$$y = (x^2-\ln x)^{x/7}$$

$$y = (x^2-\ln x)^{\frac{1}{7}x}$$

$$\ln y = \ln (x^2-\ln x)^{\frac{1}{7}x}$$

$$\ln y = \overbrace{\tfrac{1}{7}x}^{f}\ \overbrace{\ln(x^2-\ln x)}^{g}$$

$$\frac{1}{y}\left(\frac{dy}{dx}\right) = \overbrace{\frac{1}{7}}^{f'} \cdot \overbrace{\ln(x^2-\ln x)}^{g} + \overbrace{\frac{1}{7}x}^{f} \cdot \overbrace{\frac{2x-\frac{1}{x}}{x^2-\ln x}}^{g'}$$

$$\frac{1}{y}\left(\frac{dy}{dx}\right) = \frac{1}{7}\ln(x^2-\ln x) + \frac{2x^2-1}{7(x^2-\ln x)}$$

$$\frac{dy}{dx} = y\left[\frac{1}{7}\ln(x^2-\ln x) + \frac{2x^2-1}{7(x^2-\ln x)}\right]$$

$$\boxed{\frac{dy}{dx} = \sqrt[7]{(x^2-\ln x)^x}\left[\frac{1}{7}\ln(x^2-\ln x) + \frac{2x^2-1}{7(x^2-\ln x)}\right]}$$

6) Find $\frac{d}{dx} f^{-1}(2)$ given $f(x) = x^3 + 2x - 1$

$f(\ ) = 2$	$(f^{-1})(2) = \_$
	$(f^{-1})'(2) = \_$

$2 = x^3 + 2x - 1$

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

test x-values
$x = 0, 1, -1, 2, -2, \ldots$

$x = 1$

$f'(x) = 3x^2 + 2$

$f'(1) = 3(1)^2 + 2$

$f'(1) = 5$

$\boxed{(f^{-1})'(2) = \frac{1}{5}}$

7) Find $\frac{dy}{dx}$ $\quad y = \log_5\left(\frac{4}{x^2\sqrt{1-x}}\right)$

$$y = \log_5 4 - \log_5 x^2 - \log_5 (1-x)^{1/2}$$

$$y = \log_5 4 - 2\log_5 x - \frac{1}{2}\log_5(1-x)$$

$\frac{d}{dx}\log_a u = \frac{1}{\ln a}\cdot\frac{u'}{u}$

$$y' = 0 - 2\cdot\frac{1}{\ln 5}\cdot\frac{1}{x} - \frac{1}{2}\cdot\frac{1}{\ln 5}\cdot\frac{-1}{1-x}$$

$$\boxed{\frac{dy}{dx} = \frac{-2}{x\ln 5} + \frac{1}{2\ln 5(1-x)}}$$

find $\frac{dy}{dx}$ $\quad y = \sqrt[5]{\left(2^{5x} - e^{3x}\right)^{x}}$