The Chain Rule WS 1

1) $\frac{dy}{dx} = 3(-x^5 - 3x^3 + 4x)^2(-5x^4 - 9x^2 + 4)$

2) $y = (3x^2 - 5)^{1/2}$

$\frac{dy}{dx} = \frac{1}{2}(3x^2 - 5)^{-1/2}(6x) = \frac{6x}{2\sqrt{3x^2 - 5}} = \frac{3x}{\sqrt{3x^2 - 5}}$

3) $y = (4x^2 - 9)^{-2}$

$\frac{dy}{dx} = -2(4x^2 - 9)^{-3}(8x) = \frac{-16x}{(4x^2 - 9)^3}$

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

$\frac{dy}{dx} = -4(\sqrt{x} - \frac{2}{x})^{-5}(\frac{1}{2}x^{-1/2} + 2x^{-2})$

$\frac{dy}{dx} = \frac{-4(\frac{1}{2\sqrt{x}} + \frac{2}{x^2})}{(\sqrt{x} - \frac{2}{x})^5}$

5) $y = (8 - x^3)^{-1/3}$

$\frac{dy}{dx} = -\frac{1}{3}(8 - x^3)^{-4/3}(-3x^2) = \frac{x^2}{\sqrt[3]{(8 - x^3)^4}}$

6) $y = (x^{1/2} - 14x)^{1/4}$

$\frac{dy}{dx} = \frac{1}{4}(x^{1/2} - 14x)^{-3/4}(\frac{1}{2}x^{-1/2} - 14) = \frac{(\frac{1}{2\sqrt{x}} - 14)}{4\sqrt[4]{(\sqrt{x} - 14x)^3}}$

7) $y = \dfrac{\cos x}{(5x)^{1/2}}$ ← Quotient Rule

$$\frac{dy}{dx} = \frac{(-\sin x)(\sqrt{5x}) - \left[\frac{1}{2}(5x)^{-1/2}(5)\right](\cos x)}{(\sqrt{5x})^2}$$

$$= \frac{-\sqrt{5x}\sin x - \frac{5\cos x}{2\sqrt{5x}}}{5x}$$

8) $y = \dfrac{e^x}{(3x^{-2} - \ln x)^{1/5}}$ ← Quotient Rule

$$\frac{dy}{dx} = \frac{(e^x)\left(\sqrt[5]{\frac{3}{x^2} - \ln x}\right) - \left[\frac{1}{5}\left(\frac{3}{x^2} - \ln x\right)^{-4/5}\left(-6x^{-3} - \frac{1}{x}\right)\right](e^x)}{\left(\sqrt[5]{\frac{3}{x^2} - \ln x}\right)^2}$$

$$\frac{dy}{dx} = \frac{e^x \sqrt[5]{\frac{3}{x^2} - \ln x} - \frac{e^x\left(-\frac{6}{x^3} - \frac{1}{x}\right)}{5\sqrt[5]{\left(\frac{3}{x^2} - \ln x\right)^4}}}{\sqrt[5]{\left(\frac{3}{x^2} - \ln x\right)^2}}$$