Calculate the derivative using the power rule, product rule, quotient rule,

and or chain rule

1) $f(x) = 12x^3 - 6\sqrt{x} + \frac{3}{x} + e^x$

2) $f(x) = \frac{x}{4} + \sqrt{2} - 6x^{3.5} + e^{2x}$

Solution:

$(e^x)' = e^x$

$(Const)' = 0$

Power rule

$$\frac{dx^n}{dx} = nx^{n-1}$$

The product rule

$$(g(x) * h(x))' = g'(x) * h(x) + h'(x) * g(x)$$

Constant division rule

$$\big(ag(x)\big)' = ag'(x)$$

The quotient rule

$$\left(\frac{g(x)}{h(x)}\right)' = \frac{g'(x) * h(x) - h'(x) * g(x)}{h^2(x)}$$

The Sum rule

$$\big(g(x) + h(x)\big)' = g'(x) + h'(x)$$

The chain rule

If $g(x) = f(h(x))$, then

$$\frac{dg}{dx} = \frac{dg}{dh} * \frac{dh}{dx}$$

1) $f(x) = 12x^3 - 6\sqrt{x} + \frac{3}{x} + e^x$

$$f'(x) = 36x^2 - \frac{3}{\sqrt{x}} - \frac{3}{x^2} + e^x$$

2) $f(x) = \frac{x}{4} + \sqrt{2} - 6x^{3.5} + e^{2x}$

$$f'(x) = \frac{1}{4} - 21x^{2.5} + 2e^{2x}$$