HW Ch 3.1

① Find y' if

(a) $y = (4 + \sqrt[3]{x})(x^2 + 2x^3)$

Solution $y = (4 + x^{\frac{1}{3}})(x^2 + 2x^3)$

$$y' = (4 + x^{\frac{1}{3}})(x^2 + 2x^3)' + (x^2 + 2x^3)(4 + x^{\frac{1}{3}})'$$

$$= (4 + x^{\frac{1}{3}})(2x + 6x^2) + (x^2 + 2x^3)\left(\frac{1}{3}x^{-\frac{2}{3}}\right)$$

(b) $y = \dfrac{1 + \sqrt{2}x^{\frac{1}{3}} + x^2}{x}$

Solution $y = \dfrac{1 + \sqrt{2}x^{\frac{1}{3}} + x^2}{x} = \dfrac{1}{x} + \dfrac{\sqrt{2}x^{\frac{1}{3}}}{x} + \dfrac{x^2}{x}$

$$= x^{-1} + \sqrt{2}x^{-\frac{2}{3}} + x$$

$$y' = (-1)x^{-2} + \sqrt{2}\left(-\frac{2}{3}\right)x^{-\frac{5}{3}} + 1$$

(Or use quotient rule)

② Find y'' if $y = 3x^2e^x$

Solution $y = 3x^2e^x = (3x^2)(e^x)$

$$y' = (3x^2)(e^x)' + e^x(3x^2)'$$

$$= 3x^2e^x + 6xe^x$$

$$y'' = (3x^2e^x)' + (6xe^x)'$$

$$= 3x^2e^x + 6xe^x + 6x(e^x)' + e^x(6x)'$$

$$= 3x^2e^x + 6xe^x + 6xe^x + 6e^x$$

$$= 3x^2e^x + 12xe^x + 6e^x$$