1. i) $y = (x^3)^{1/2} = x^{3/2}$

$\frac{dy}{dx} = \frac{3}{2} x^{1/2} = \frac{3\sqrt{x}}{2}$

ii) $\frac{dy}{dx} = \frac{x(8x) - (4x^2+3)(1)}{x^2} = \frac{8x^2 - 4x^2 - 3}{x^2} = \frac{4x^2-3}{x^2}$

2. $f'(x) = 3x^2 - 12x + 12$

show $\boxed{3x^2 - 12x + 12 > 0}$

ie $\underbrace{x^2 - 4x + 4}_{(x-2)(x-2)} > 0$

$(x-2)^2$ ~ is always $> 0$ since $(\text{anything})^2 > 0$.

3. $y = kx^2$.

$\frac{dy}{dx} = 2kx$

$x\frac{dy}{dx} + \frac{1}{2}\left(\frac{dy}{dx}\right)^2 + y = 0$

$x(2kx) + \frac{1}{2}(2kx)^2 + kx^2 = 0$

$2kx^2 + 2k^2x^2 + kx^2 = 0$

$3kx^2 + 2k^2x^2 = 0$

$3\cancel{k}\cancel{x^2} = -2k^2\cancel{x^2}$

$\frac{-3}{2} = k$

Scanned by CamScanner

4)

$$f(x+h) = (x+h)^2 + 3(x+h) + 5$$

$$= x^2 + 2xh + h^2 + 3x + 3h + 5$$

$$f(x) = x^2 \qquad + 3x \qquad + 5$$

---

$$f(x+h) - f(x) = 2xh + h^2 + 3h$$

$$\frac{f(x+h) - f(x)}{h} = 2x + h + 3$$

$$\frac{dy}{dx} = \lim_{h \to 0} 2x + h + 3 \qquad = 2x + 3$$