1F. Chain rule, implicit differentiation

3)

$y = x^{1/n}$

$$\boxed{\frac{dy}{dx} = \frac{1}{n} x^{\frac{1}{n}-1}}$$

5)

$\sin x + \sin y = \frac{1}{2}$

$\cos x + \frac{dy}{dx} \cos y = 0$

$\frac{dy}{dx} = -\frac{\cos x}{\cos y}$

$$\boxed{\frac{dy}{dx} = 0 \quad \text{when} \quad x = \dots, -\frac{3\pi}{2}, -\frac{\pi}{2}, \frac{3\pi}{2}, \frac{\pi}{2}, \dots \quad \text{and} \quad y \neq \dots, -\frac{3\pi}{2}, -\frac{\pi}{2}, \frac{3\pi}{2}, \frac{\pi}{2}, \dots}$$

8a)

$V = \frac{1}{3}\pi r^2 h$

$0 = \frac{\pi}{3} \cdot \left(\frac{dr}{dh} 2rh + 1 \cdot r^2 \right)$

$0 = \frac{dr}{dh} \cdot \frac{2\pi rh}{3} + \frac{\pi r^2}{3}$

$$\boxed{\frac{dr}{dh} = -\frac{r}{2h}}$$

8c)

$$c^2 = a^2 + b^2 - 2ab\cos\theta$$

$$0 = \frac{da}{db}2a + 2b - 2\cos\theta\left(\frac{da}{db}\cdot b\right) - 2\cos\theta(a\cdot 1)$$

$$\frac{da}{db}2b\cos\theta - \frac{da}{db}2a = 2b - 2a\cos\theta$$

$$\frac{da}{db} = \frac{-2a\cos\theta - 2b}{2b\cos\theta - 2a} = \boxed{\frac{a\cos\theta - b}{a - b\cos\theta}}$$