Practice differentiating the following with respect to **t**.

1.

(a). If x does not depend on t (i.e. x is constant), then $\frac{d}{dt}[x] = 0$

(b). If x depends on t, then $\frac{d}{dt}[x] = \frac{dx}{dt}$

2.

(a). If y does not depend on t (i.e. y is constant), then $\frac{d}{dt}[y^2] = 0$

(b). If y depends on t, then $\frac{d}{dt}[y^2] = 2y\frac{dy}{dt}$

3.

(a). If x does not depend on t (i.e. x is constant) and y depends on t, then $\frac{d}{dt}[x^2 + y^2] = 2y\frac{dy}{dt}$

(b). If x depends on t and y does not depend on t (i.e. y is constant), then $\frac{d}{dt}[x^2 + y^2] = 2x\frac{dx}{dt}$

(c). If x depends on t and y depends on t, then $\frac{d}{dt}[x^2 + y^2] = 2x\frac{dx}{dt} + 2y\frac{dy}{dt}$

4.

(a). If x does not depend on t (i.e. x is constant) and y depends on t, then $\frac{d}{dt}[xy] = x\frac{dy}{dt}$

(b). If x depends on t and y does not depend on t (i.e. y is constant), then $\frac{d}{dt}[xy] = y\frac{dx}{dt}$

(c). If x depends on t and y depends on t, then $\frac{d}{dt}[xy] = x\frac{dy}{dt} + y\frac{dx}{dt}$

5.

(a). If x does not depend on t (i.e. x is constant), then $\dfrac{d}{dt}[\sin x] = 0$

(b). If x depends on t, then $\dfrac{d}{dt}[\sin x] = \cos x \dfrac{dx}{dt}$

6.

(a). If x does not depend on t (i.e. x is constant) and y depends on t, then $\dfrac{d}{dt}\left[\dfrac{x}{y}\right] = \dfrac{-x}{y^2}\dfrac{dy}{dt}$

(b). If x depends on t and y does not depend on t (i.e. y is constant), then $\dfrac{d}{dt}\left[\dfrac{x}{y}\right] = \dfrac{1}{y}\dfrac{dx}{dt}$

(c). If x depends on t and y depends on t , then $\dfrac{d}{dt}\left[\dfrac{x}{y}\right] = \dfrac{y\dfrac{dx}{dt} - x\dfrac{dy}{dt}}{y^2}$

7.

(a). If r does not depend on t (i.e. r is constant) and h depends on t, then $\dfrac{d}{dt}\left[\dfrac{1}{3}\pi r^2 h\right] = \dfrac{1}{3}\pi r^2 \cdot \dfrac{dh}{dt}$

(b). If r depends on t and h does not depend on t (i.e. h is constant), then $\dfrac{d}{dt}\left[\dfrac{1}{3}\pi r^2 h\right] = \dfrac{1}{3}\pi h \cdot 2r\dfrac{dr}{dt}$

(c). If r depends on t and h depends on t, then $\dfrac{d}{dt}\left[\dfrac{1}{3}\pi r^2 h\right] = \dfrac{1}{3}\pi r^2 \cdot \dfrac{dh}{dt} + h\left(\dfrac{1}{3}\pi \cdot 2r\dfrac{dr}{dt}\right)$