Parametric Differentiation Worksheet

1. Find $\dfrac{\mathrm{d}y}{\mathrm{d}x}$ if

   (a) $y(t) = t^2$ and $x(t) = \sin t$.

   (b) $y(t) = \sin t$ and $x(t) = \cos t$.

   (c) $y(t) = \cos t$ and $x(t) = \sin\left(t^2\right)$.

   (d) $y(t) = e^t$ and $x(t) = t^2$.

   (e) $y(t) = t^2$ and $x(t) = \sin t$.

2. A curve is defined by the parametric equations

   $$x = t - t^2 \quad \text{and} \quad y = t + t^2.$$

   Calculate $\dfrac{\mathrm{d}y}{\mathrm{d}x}$ and $\dfrac{\mathrm{d}^2y}{\mathrm{d}x^2}$ in terms of t.

3. A curve is defined by the parametric equations

   $$x = \sin t \quad \text{and} \quad y = \cos t.$$

   Calculate $\dfrac{\mathrm{d}y}{\mathrm{d}x}$ and $\dfrac{\mathrm{d}^2y}{\mathrm{d}x^2}$ in terms of t.

4. A curve is defined by the parametric equations

   $$x = e^t \quad \text{and} \quad y = e^{t^2+1}.$$

   Calculate $\dfrac{\mathrm{d}y}{\mathrm{d}x}$ and $\dfrac{\mathrm{d}^2y}{\mathrm{d}x^2}$ in terms of t.