Parametric Differentiation Worksheet: Solutions

1. (a) $\dfrac{\mathrm{d}y}{\mathrm{d}x} = \dfrac{\frac{\mathrm{d}y}{\mathrm{d}t}}{\frac{\mathrm{d}x}{\mathrm{d}t}} = \dfrac{2t}{\cos t}.$

   (b) $\dfrac{\mathrm{d}y}{\mathrm{d}x} = \dfrac{\frac{\mathrm{d}y}{\mathrm{d}t}}{\frac{\mathrm{d}x}{\mathrm{d}t}} = \dfrac{\cos t}{-\sin t} = -\cot t.$

   (c) $\dfrac{\mathrm{d}y}{\mathrm{d}x} = \dfrac{-\sin t}{2t\cos\left(t^2\right)}$

   (d) $\dfrac{\mathrm{d}y}{\mathrm{d}x} = \dfrac{e^t}{2t}$

   (e) $\dfrac{\mathrm{d}y}{\mathrm{d}x} = \dfrac{2t}{\cos t}$

2. $\dfrac{\mathrm{d}y}{\mathrm{d}x} = \dfrac{1+2t}{1-2t}$; $\dfrac{\mathrm{d}^2y}{\mathrm{d}x^2} = \dfrac{4}{(1-2t)^3}.$

3. $\dfrac{\mathrm{d}y}{\mathrm{d}x} = -\tan t$; $\dfrac{\mathrm{d}^2y}{\mathrm{d}x^2} = -\sec^3 t.$

4. $\dfrac{\mathrm{d}y}{\mathrm{d}x} = 2te^{t^2-t+1}$; $\dfrac{\mathrm{d}^2y}{\mathrm{d}t^2} = \left(4t^2-2t+2\right)e^{t^2-2t+1}.$