1. Let C be the curve defined by the relation

$$x^2 + e^{y^2} + e^{\sqrt{x+y}} = 1.$$

Find a formula for $\frac{dy}{dx}$.

2. Let Γ be the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$.

(a) Find an equation for the slope of the tangent line to Γ at (x, y).

(b) Γ can be parametrized with $(x(t), y(t)) = (a\cos(t), b\sin(t))$. Confirm that this gives the same slope as the formula in part (a).

(c) Find a formula for $\frac{d^2y}{dx^2}$ in terms of t or in terms of (x, y).

3. Matt is megaboarding in the park with coordinates $x(t) = \frac{t+1}{t^2+1} - 2t + 2$ and $y(t) = 2\sqrt{t^3} + t^2$.

(a) Find $\frac{dy}{dx}(t)$.

(b) Find all times when the tangent line is horizontal.

(c) At time $t = 1$ Matt leaves his parametrized curve and travels along his tangent line. How long does it take Matt to reach the y-axis?