AP Review Day 1

You may NOT use a calculator for any of these questions.

1. If $xy^2 + x = 3y$, then find $\frac{dy}{dx}$ in terms of x and y. *[Implicit Differentiation]*

2. If $f(x) = -2\cos(3x^2)$, determine $f'(x)$. *[Derivative Rules]*

3. Solutions to the differential equation $\frac{dy}{dx} = xy^3$ also satisfies $\frac{d^2y}{dx^2} = y^3(1 + 3x^2y^2)$. Let $y = f(x)$ be a particular solution to the differential equation $\frac{dy}{dx} = xy^3$ with $f(1) = 2$.
   [Differential Equations, Tangent Lines, Linear Appriximations]
   a. Write an equation for the tangent line to the graph of y = f(x) at x = 1.

   b. Use the tangent line equation from part (a) to approximate f(1.1).

   c. Find the particular solution y = f(x) with the initial condition f(1) = 2.