Quiz   **Name**

1. Let a and b be constants and define the function $f(x)$ by

$$f(x) = x^2 + x + a, \text{ for } x < 1 \quad \text{and} \quad f(x) = bx^3 - 3x^2, \text{ for } 1 \le x.$$

Determine a and b so that this function differentiable for all x.

2. Check that the point $(1, 2)$ is on the graph of the function $f(x) = \sqrt{x^2 + 3x}$ and then determine an equation for the tangent line to the graph at that point.

3. Consider the function $f(x) = x^{\frac{2}{3}}$. Let m be any real number. Is there a point on the graph of $f(x)$ that has a tangent line with slope m? If yes find the point. If there is an m for which this is not true, give an example of such an m.