

NAME:

STUDENT NO:

**Q-3)** Find an equation for the tangent line of the plane curve  $x^2 + xy + y^3 = 11$  at the point  $(1, 2)$ . Is the point  $(4, 1)$  on this tangent line?

**Solution:** Let  $f(x, y) = x^2 + xy + y^3 - 11$ . Check that  $f(1, 2) = 0$  so the given point is on the curve.  $\nabla f = (2x + y, x + 3y^2)$ .  $\nabla f(1, 2) = (4, 13)$ .

An equation for the tangent line at  $(1, 2)$  is  $(4, 13) \cdot (x - 1, y - 2) = 0$  or equivalently

$$4x + 13y = 30.$$

Check that  $4 \cdot 4 + 13 \cdot 1 = 29$  so the point  $(4, 1)$  is not on this line.