How to find the equation of a tangent to a quadratic function using differentiation?

As you can see from the picture there is curve with a line touching it at one point, this line is called a tangent. To make it simpler: a tangent is a straight line that touches the curve at one point where the gradient of the curve at that particular point is equal to the gradient of the line.

How do we work out a tangent?

It is very simple, there are only four steps:
1. Differentiate the equation of the curve.
2. Place the x-coordinate into the equation to find the gradient of the tangent.
3. Place the x-coordinate into the original equation of the curve to find the y-coordinate
4. Assemble everything together. using the formula y = mx + c.

Example: Find the equation of the tangent to $y = 3x^3 - 2x + 1$ at the point where x = 1.
1. $9x^2$ - 2.
2. $9(1)^2$ - 2 = 9 - 2 = 7 → gradient of the tangent (m)
3. $y = 3(1)^3 - 2(1) + 1$ → y = 3 - 2 +1 → y = 2 coordinate = (1 , 2).
4. y = mx + c. y = 2, m = 7, x = 1 c = ? we are trying to find c, the y-intercept.
   2 = (7 x 1) + c → 2 = 7 + c → 2 - 7 = c → -5 = c → equation of tangent: y = 7x - 5