Tangents & Normals

You are reminded that $\frac{dy}{dx}$ *is* the gradient of a curve. Also, if a curve passes through a point, then the x and y values of the point fit into the equation of the curve. And finally, if a line has gradient m, then the perpendicular gradient is $-\frac{1}{m}$.

Give all answers in the form $y = mx + c$, where m and c are constants to be found.

1. Find the equation of the tangent to $y = x^2 + 5x - 7$ when $x = 3$. $\boxed{y = 11x - 21}$

2. Find the equation of the normal to $y = x^2 - x + 2$ when $x = 2$. $\boxed{y = -\frac{1}{3}x + \frac{14}{3}}$

3. Find the equation of the tangent to $y = 3 - 2x + 3x^2$ when $x = 0$. $\boxed{y = -2x + 3}$

4. Find the equation of the normal to $y = (x + 3)(x - 2)$ when $x = 4$. $\boxed{y = -\frac{1}{9}x + \frac{130}{9}}$

5. Find the equation of the tangent to $y = (2x - 5)^2$ when $x = -1$. $\boxed{y = -28x + 21}$

6. Find the equation of the normal to $y = 4 - (x - 3)(x + 4)$ when $x = 2$. (Careful of that minus!) $\boxed{y = \frac{1}{5}x + \frac{48}{5}}$

7. Find the equation of the tangent to $y = 2x^3 - x + 2$ when $x = -1$. $\boxed{y = 5x + 6}$

8. Find the equation of the normal to $y = \frac{1}{x}$ when $x = 2$. $\boxed{y = 4x - \frac{15}{2}}$

9. Find the equation of the tangent to $y = \sqrt{x}$ when $x = 9$. $\boxed{y = \frac{1}{6}x + \frac{3}{2}}$

10. Find the equation of the normal to $y = \frac{3}{\sqrt{x}}$ when $x = 4$. $\boxed{y = \frac{16}{3}x - \frac{119}{6}}$