Edexcel A level Maths Further differentiation

Topic assessment

1. Differentiate the following functions.
   (i) $y = x^3 \ln 2x$ [4]
   (ii) $y = \sin^2 x$ [4]
   (iii) $y = x^2 \cos x$ [4]
   (iv) $y = \dfrac{x}{\tan 2x}$ [4]

2. Find an expression in terms of x and y for the gradient of the curve
   $$x^2 + y^2 - 3x + 4y = 6$$
   For what value of y is the tangent to the curve vertical? [5]

3. Find the equation of the tangent to the curve $y = \ln(3x - 5)$ at the point where $x = 3$. [5]

4. Show that the curve $y = x - \ln x$ has one turning point only, and give the coordinates of this point. [5]

5. A curve has $y = e^{2x} \cos x$.
   (i) Show that the turning points of the curve occur at the points for which $\tan x = 2$. [5]
   (ii) Find the equation of the normal to the curve at the point for which $x = 0$. [5]

6. For the curve $y = x^2 e^{-x}$,
   (i) Write down the coordinates of the point(s) where the curve cuts the axes. [1]
   (ii) Find the gradient function for the curve and hence the coordinates of any turning points, distinguishing between them. [8]

Total 50 marks