MST124 Unit 7 Tutorial Questions 07_01_2025

Differentiate the functions in question 1 to 8, simplifying your answers where possible.

1. $f(t) = e^{2t} \ln 4t$

2. $y = \frac{4x^2+3x+5}{(x+1)^2}$

3. $g(x) = \sin(\ln x)$

4. $p = (2x + 3)(x^2 + 1)^4$

5. $h(x) = \sin^{-1}\left(\frac{1}{x}\right)$

6. $k(x) = \ln\left(\frac{1+\sin x}{1-\sin x}\right)$

7. $r = \frac{\sec\theta+\tan\theta}{\sec\theta-\tan\theta}$

8. $y = \sin^2(\cos(9x))$

9. A farmer needs to enclose a rectangular area of a field with a fence. They have 500m of fencing material and there is a wall on one side of the field.
   What is the maximum area of field that can be enclosed?

10. A piece of wire 80cm in length is cut into three parts, two of which are bent into equal circles and the third into a square. What is the radius of each of the circles if the total area enclosed by the three shapes is a minimum?
    Give your answer in terms of π.