MATH 401 INTRODUCTION TO ANALYSIS, SPRING TERM 2024, PROBLEMS 1

Review of Calculus

Return by Wednesday 17th January

1. Differentiate the following with respect to x.
   (i) $(2x-1)(3x+2)$.
   (ii) $x^{\frac{1}{2}}(x+1)$.
   (iii) $x^3 \ln x$.
   (iv) $e^x \sin x$.
   (v) $\frac{x^2+1}{x+1}$.
   (vi) $(2x^2-1)(x^3+4)^3$.
   (vii) $\left(x+\frac{1}{x}\right)^{-1}$.
   (viii) $\tan^4 x$.

2. Given that $x^2 - 3xy + 2y^2 - 2x = 4$, find the value of $\frac{dy}{dx}$ at the point $(1,-1)$.

3. Find the equation of the tangent to the curve $y = 4\sin^2 x - 2\cos x$ at the point where $x = \frac{\pi}{3}$.

4. Find the extremal point on the curve

$$y = \frac{1}{x^2+2x+4}$$

and determine whether it is a max or a min.

5. Sketch the curve

$$y = \frac{3(x-2)}{x(x+6)}.$$