

**MATH 401 INTRODUCTION TO ANALYSIS-I,
FALL TERM 2009 PROBLEMS 1**

REVIEW OF CALCULUS

Return by Monday 31st August

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) $\frac{x^2+1}{x+1}$.
2. Prove that $\frac{d}{dx}(\tan x - x) = \tan^2 x$. Hint: The trig. formula $\sec^2 x = \tan^2 x + 1$ could be useful.
3. Differentiate with respect to x .
 - (i) $(2x^2 - 1)(x^3 + 4)^3$.
 - (ii) $(x + \frac{1}{x})^{-1}$.
 - (iii) $\tan^4 x$.
4. Given that $x^2 - 3xy + 2y^2 - 2x = 4$, find the value of $\frac{dy}{dx}$ at the point $(1, -1)$.
5. Find the equation of the tangent to the curve $y = 3x^3 - x$ at the point where $x = \frac{2}{3}$.
6. A curve has the equation $y = x \sin 2x$. Find the gradient of the curve at $x = \pi/3$.
7. Find the maximum point on the curve

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

and show that there are points of inflexion at $(0, \frac{1}{4})$ and $(-2, \frac{1}{4})$.

8. Sketch the curve

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