

National University of Singapore

Department of Mathematics

Level 1000 (2005/2006) Semester 2

MA1102R Calculus

Tutorial Set 9

- Let $f(x) = x^3 + 7x - 10$.
 - On the same set of axes, sketch the graphs of the functions f and f^{-1} .
 - Find the slope of the tangent line to the graph of f at the point $(1, -2)$.
 - Find the slope of the tangent line to the graph of f^{-1} at the point $(-2, 1)$.
- Differentiate the following functions.
 - $f(x) = x^{\tan(x)}$; $x \in (0, \infty)$.
 - $g(x) = \ln\left(\int_0^{\sin^3(x)} \frac{1}{1+t^2+\sin^2(t+t^2)} dt\right)$; $x \in (0, \frac{\pi}{2}]$.
 - $h(x) = x^{(e^{x^2+x})}$; $x > 0$.
 - $u(x) = (\ln(x+1))^{\ln(x+1)}$; $x > 1$.
 - $g(x) = (17^x)^{7^x}$.
 - $k(x) = \log_5(\log_7(x+2))$.
- Find the following integrals.
 - $\int x^2 17x^3 dx$.
 - $\int x e^{3+2x^2} dx$.
 - $\int (x+1)e^x 13^{xe^x} dx$.
- Find $\frac{dy}{dx}$ implicitly when $\tan^{-1}(x+5y) = \ln(y)$.
- Find the following integrals.
 - $\int \frac{1}{(x^2+5)(6+x^2)} dx$.
 - $\int_4^6 \frac{1}{\sqrt{x}\sqrt{8-x}} dx$.
 - $\int_0^1 \frac{x}{1+x^4} dx$.
- Use integration by parts to find the following integrals.
 - $\int \sec^{-1}(x) dx$.
 - $\int x^2 \cos(2x) dx$.
 - $\int \sin(\ln(x^2)) dx$.
- Evaluate :
 - $\int_{\frac{1}{3}}^3 \sqrt{x} \tan^{-1}(\sqrt{x}) dx$.
 - $\int_0^4 \ln(x^2+1) dx$.
- Find
 - $\int \sin^6(3x) \cos(3x) dx$;
 - $\int \sin^6(x) \cos^4(x) dx$.