Assignment 0

Integration Revision Problems–not for submission.

1. Find
   (a) $\displaystyle\int_0^u \frac{1}{2+x^2}\,dx,$
   (b) $\displaystyle\int_0^1 \frac{t-1}{1+2t-t^2}\,dt,$
   (c) $\displaystyle\int_0^q \frac{x}{1-x^2}\,dx,$
   (d) $\displaystyle\int \cos nt \cos mt\,dt,$
   (e) $\displaystyle\int \sin nt \cos mt\,dt,$
   (f) $\displaystyle\int_0^u \frac{-4x+2}{2x+1}\,dx,$
   (g) $\displaystyle\int \frac{4x-2}{4x^2-x}\,dx,$
   (h) $\displaystyle\int e^{2x}(2x+1)^2\,dx,$
   (i) $\displaystyle\int \frac{x^2(2x-1)^2}{(4x-1)^2}\,dx,$
   (j) $\displaystyle\int \frac{1}{x^2(1-x^2)}\,dx,$
   (k) $\displaystyle\int_0^\pi x\sin x - \cos x\,dx.$
2. Differentiate with respect to x the function y defined by
   $$y = \int_0^\pi \cos(x\sin\phi)\,d\phi,$$
   and show that
   $$y' = -x\int_0^\pi \cos(x\sin\phi)\cos^2\phi\,d\phi.$$
3. If
   $$y = \int_0^x \frac{du}{\sqrt{x^4-u^4}},$$
   is y a decreasing or increasing function of x? Find an integral expression for y'.