


Cal II (S) (Maths 201–NYB)

1. Evaluate the following:

(a) $\int \frac{1}{x^2} \sec^2\left(\frac{1}{x}\right) dx$

(b) $\int \frac{x^2 - 1}{x\sqrt{x^2 - 1}} dx$

(c) $\int \frac{dx}{\sqrt[3]{2 + 3x}}$

(d) $\int \frac{(\ln t)^2}{t} dt$

(e) $\int (\ln x)^2 dx$

(f) $\int \frac{1 + \cos \theta}{\sin^2 \theta} d\theta$

(g) $\int_1^{\sqrt{3}} \frac{t + \arctan t}{t^2 + 1} dt$

(h) $\int \frac{1 + e^{\sqrt{x}}}{\sqrt{x}} dx$

(i) $\int x^2 e^{3x} dx$

(j) $\int \tan(1 + x) dx$

(k) $\int \frac{(x + 1)}{\sqrt{x^2 + 2x - 3}} dx$

(l) $\int e^x \cos 2x dx$

(m) $\int_1^2 x \operatorname{arcsec} x dx$

(n) $\int_0^2 \frac{2x^3}{\sqrt{5 + x^2}} dx$

(o) $\int \frac{\sqrt{4x^2 - 9}}{x} dx$

2. Find the derivative $\frac{dy}{dx}$ for the following. Do not simplify your answers.

(a) $y = \frac{x + \cos x}{\arccos(x)}$

(b) $y = \sec(x) \sec^{-1}(x)$

3. (a) Calculate the exact value of $\cos\left(\operatorname{arccsc}\left(\frac{7}{3}\right)\right)$.

(b) Simplify the expression $\sec(\tan^{-1}(x))$,
expressing your answer in a form without any trig or inverse trig.

4. (a) Find (if possible) an x for which $\arcsin(\sin x) = x$, and another x for which $\arcsin(\sin x)$ is *not* equal to x .

(b) Is it always true that $\sin(\arcsin x) = x$? If not, give an example where the equation fails, and if so, then briefly explain why.