Math - Calculus II REVIEW # 1

1. Evaluate: (Integrals involving exponential & log functions)

(a) $\int \sqrt{x}\, e^{\sqrt{x^3}}\, dx$; (b) $\int 4^{3x+1}\, dx$; (c) $\int \frac{(e^x+1)(e^{2x}+3)}{e^{2x}}\, dx$

(d) $\int x^2\, e^{3x}\, dx$; (e) $\int e^{\sqrt{x}}\, dx$; (f) $\int \frac{(1 + 2 \ln x)^4}{x}\, dx$

(g) $\int \sqrt{x}\, (\ln x)^2\, dx$; (h) $\int \frac{(\ln x)^2}{x}\, dx$; (i) $\int \ln x \sqrt{x \ln x - x}\, dx$

2. Evaluate: (Integrals involving trig functions)

(a) $\int \frac{\sin \sqrt{x}}{\sqrt{x}}\, dx$; (b) $\int (x \cot x^2 - 4 \sec 3x \tan 3x)\, dx$

(c) $\int \frac{(1 + \tan 3x)^{100}}{\cos^2 3x}\, dx$; (d) $\int \cos^2 2x \sin^3 2x\, dx$

(e) $\int \sin^2 2x \cos^2 2x\, dx$; (f) $\int \cot^3 x \csc^4 x\, dx$

(g) $\int x^2 \cos 3x\, dx$; (h) $\int \sec^4 2x\, dx$; (i) $\int \tan^4 6x\, dx$

(j) $\int \sin(\ln x)\, dx$; (k) $\int \frac{\sin(\ln x)}{x}\, dx$; (l) $\int \frac{1 - \tan^2 x}{\sec^2 x}\, dx$

(m) $\int \frac{dx}{1 - \cos x}$;(n) $\int (\sec x + \csc x)^2\, dx$;(o) $\int \frac{\cos x + \sin x}{\sin 2x}\, dx$

(p) $\int \cos 5x \sin 2x\, dx$; (q) $\int \frac{\arcsin x}{\sqrt{1-x^2}}\, dx$

3. Evaluate: (Algebraic integrals)

(a) $\int \frac{4x^3-2x^2+5x-4}{x+2}\, dx$; (b) $\int (2x-1)^{10} (x+3)\, dx$

(c) $\int \frac{x-4}{\sqrt{1-x^2}}\, dx$; (d) $\int \left(x \sqrt{2x^2+4} - \frac{1}{3x-2} \right) dx$

(e) $\int_1^4 \frac{1}{x^2}\sqrt{1+\frac{1}{x}}\,dx$

4. Evaluate: (exact answer - no decimals !)

(a) $\int_0^1 \frac{3x-1}{x^2+1}\,dx$; (b) $\int_0^{\sqrt{3}} \arctan x\,dx$; (c) $\int_{\frac{1}{4}}^1 \frac{\arcsin\sqrt{x}}{\sqrt{x}}\,dx$

(d) $\int_1^{e^2} \frac{\ln x}{\sqrt{x}}\,dx$

Answers:

(1 a) $\frac{2}{3}e^{x^{3/2}}+C$; (1 b) $\frac{4^{3x+1}}{3\ln(4)}+C$; (1 c) $e^x+x-3e^{-x}-\frac{3}{2}e^{-2x}+C$

(1 d) $\frac{1}{3}x^2e^{3x}-\frac{2}{9}xe^{3x}+\frac{2}{27}e^{3x}+C$; (1 e) $2\sqrt{x}\,e^{\sqrt{x}}-2e^{\sqrt{x}}+C$

(1 f) $\frac{1}{10}(1+2\ln x)^5+C$

(1 g) $\frac{2}{3}x^{3/2}(\ln x)^2-\frac{8}{9}x^{3/2}\ln x+\frac{16}{27}x^{3/2}+C$

(1 h) $\frac{(\ln x)^3}{3}+C$; (1 i) $\frac{2}{3}(x\ln x-x)^{3/2}+C$

(2 a) $-2\cos\sqrt{x}+C$; (2 b) $\frac{1}{2}\ln|\sin x^2|-\frac{4}{3}\sec 3x+C$

(2 c) $\frac{1}{303}(1+\tan 3x)^{101}+C$

(2 d) $-\frac{1}{6}(\cos 2x)^3+\frac{1}{10}(\cos 2x)^5+C$; (2 e) $\frac{1}{8}x-\frac{1}{64}\sin 8x+C$

(2 f) $-\frac{1}{4}(\cot x)^4-\frac{1}{6}(\cot x)^6+C$

or $-\frac{1}{6}(\csc x)^6 + \frac{1}{4}(\csc x)^4 + C$

(2 g) $\frac{1}{3}x^2 \sin 3x + \frac{2}{9}x \cos 3x - \frac{2}{27}\sin 3x + C$

(2 h) $\frac{1}{6}\tan^3 2x + \frac{1}{2}\tan 2x + C$; (2 i) $\frac{1}{18}\tan^3 6x - \frac{1}{6}\tan 6x + x + C$

(2 j) $\frac{1}{2}x \sin(\ln x) - \frac{1}{2}x \cos(\ln x) + C$; (2 k) $-\cos(\ln x) + C$

(2 l) $\frac{1}{2}\sin 2x + C$; (2 m) $-\cot x - \csc x + C$

(2 n) $\tan x + 2\ln|\sec x| + 2\ln|\sin x| - \cot x + C$

(2 o) $\frac{1}{2}\ln|\csc x - \cot x| + \frac{1}{2}\ln|\sec x + \tan x| + C$

(2 p) $\frac{2}{21}\cos 2x \cos 5x + \frac{5}{21}\sin 5x \sin 2x + C$

(2 q) $\frac{1}{2}(\arcsin x)^2 + C$

(3 a) $\frac{4}{3}x^3 - 5x^2 + 25x - 54\ln|x+2| + C$

(3 b) $\frac{1}{48}(2x-1)^{12} + \frac{7}{44}(2x-1)^{11} + C$; (3 c) $-\sqrt{1-x^2} - 4\arcsin x + C$

(3 d) $\frac{1}{6}(2x^2+4)^{3/2} - \frac{1}{3}\ln|3x-2| + C$; (3 e) $-\frac{2}{3}\left(\frac{5}{4}\right)^{3/2} + \frac{2}{3}(2)^{3/2}$

(4 a) $\frac{3}{2}\ln(2) - \frac{\pi}{4}$; (4 b) $\frac{\pi}{\sqrt{3}} - \frac{1}{2}\ln(4)$; (4 c) $\frac{5\pi}{6} - \sqrt{3}$; (4 d) 4