Math - Calculus II   <u>REVIEW # 3</u>

1. <u>Evaluate</u>:

(a) $\displaystyle\int \frac{\sqrt[3]{2+\sqrt{x}}}{\sqrt{x}}\ dx$;(b) $\displaystyle\int \frac{dx}{e^{x}+e^{-x}}$;(c) $\displaystyle\int \frac{\cos\ (\arctan\ x)}{x^{2}+1}\ dx$

(d) $\displaystyle\int \sec^{3} x\ dx$;(e) $\displaystyle\int \frac{1-x}{\sqrt{1-x^{2}}}\ dx$;(f) $\displaystyle\int x^{2}\ e^{2x}\ dx$

(g) $\displaystyle\int \frac{dx}{x\ \ln\ x}$;(h) $\displaystyle\int_{0}^{\frac{\pi}{2}} \sin^{2} x\ \cos^{2}x\ dx$;(i) $\displaystyle\int \frac{dx}{(\ (x-2)^{2}\ +\ 9\ )^{3/2}}$

(j) $\displaystyle\int \frac{3x^{3}-5x^{2}-11x+9}{x^{2}-2x-3}\ dx$;(k) $\displaystyle\int \sec^{4} x\ \tan^{3} x\ dx$;(l) $\displaystyle\int e^{2x}\ \sin\ x\ dx$

(m) $\displaystyle\int \frac{\sqrt{4x^{2}-25}}{x}\ dx$;(n) $\displaystyle\int \frac{2x-1}{x^{2}\ (3x+1)}\ dx$;(o) $\displaystyle\int x\ \arccos\ x\ dx$

2. Alg Sub or Basic Sub or Trig Sub

(a) $\displaystyle\int \frac{x\ dx}{\sqrt{x^{2}-1}}$;(b) $\displaystyle\int_{0}^{\sqrt{3}} \frac{dx}{(4-x^{2})^{3/2}}$;(c) $\displaystyle\int \frac{x^{3}\ dx}{\sqrt{4-x^{2}}}$

(d) $\displaystyle\int \frac{x^{2}\ dx}{(9-4x^{2})^{3/2}}$;(e) $\displaystyle\int \frac{\sqrt{9x^{2}-4}}{x}\ dx$;(f) $\displaystyle\int \frac{dx}{x^{2}\ \sqrt{x^{2}-1}}$

(g) $\displaystyle\int x^{3}\ \sqrt{x^{2}-4}\ dx$;(h) $\displaystyle\int \frac{x^{3}\ dx}{\sqrt{4x^{2}-9}}$;(i) $\displaystyle\int_{\sqrt{5}}^{\sqrt{20}} \frac{dx}{(x^{2}-4)^{3/2}}$

(j) $\displaystyle\int_{0}^{3/2} \frac{dx}{\sqrt{9-2x^{2}}}$;(k) $\displaystyle\int \frac{3x+4}{x^{2}+1}\ dx$;(l) $\displaystyle\int \frac{\sqrt{x^{2}-5}}{x^{2}}\ dx$

3.

(a) $\displaystyle\int x\ \arctan\ x\ dx$;(b) $\displaystyle\int \frac{\sqrt{4x^{2}-9}}{x}\ dx$;(c) $\displaystyle\int \frac{x^{3}\ dx}{\sqrt{25-x^{2}}}$

(d) $\int \tan^4 \theta \, d\theta$; (e) $\int \dfrac{\sec^4 \theta \, d\theta}{\sqrt{\tan \theta}}$; (f) $\int \dfrac{2x^2 - 3x - 6}{x^2 - 4} \, dx$

(g) $\int \dfrac{x^2 + 14x + 4}{(x+1)^2 \, (2x-1)} \, dx$; (h) $\int \dfrac{dx}{x \sqrt{16 - 9x^2}}$

Answers:

(1 a) $\dfrac{3}{2} (2 + \sqrt{x})^{4/3} + C$; (1 b) $\arctan(e^x) + C$

(1 c) $\sin(\arctan x) + C = \dfrac{x}{\sqrt{1 + x^2}} + C$

(1 d) $\dfrac{1}{2} \sec x \tan x + \dfrac{1}{2} \ln|\sec x + \tan x| + C$

(1 e) $\arcsin x + \sqrt{1 - x^2} + C$; (1 f) $\dfrac{1}{2}x^2 e^{2x} - \dfrac{1}{2}x e^{2x} + \dfrac{1}{4} e^{2x} + C$

(1 g) $\ln|\ln x| + C$; (1 h) $\dfrac{\pi}{16}$; (1 i) $-\dfrac{1}{9} \dfrac{x-2}{\sqrt{(x-2)^2 + 9}} + C$

(1 j) $\dfrac{3}{2}x^2 + x + 3 \ln|x-3| - 3 \ln|x+1| + C$

(1 k) $\dfrac{1}{6} \tan^6 x + \dfrac{1}{4} \tan^4 x + C$ or $\dfrac{1}{6} \sec^6 x - \dfrac{1}{4} \sec^4 x + C$

(1 l) $\dfrac{2}{5} e^{2x} \sin x - \dfrac{1}{5} e^{2x} \cos x + C$

(1 m) $\sqrt{4x^2 - 25} - 5 \operatorname{arcsec}\left(\dfrac{2x}{5}\right) + C$; (1 n) $5 \ln|x| + \dfrac{1}{x} - 5 \ln|3x+1| + C$

(1 o) $\dfrac{x^2}{2} \arccos x + \dfrac{1}{4} \arcsin x - \dfrac{x \sqrt{1 - x^2}}{4} + C$

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

(2 d) $\dfrac{x}{4\sqrt{9-4x^2}} - \dfrac{1}{8}\arcsin\left(\dfrac{2x}{3}\right) + C$

(2 e) $\sqrt{9x^2-4} - 2\operatorname{arcsec}\left(\dfrac{3x}{2}\right) + C$; (2 f) $\dfrac{\sqrt{x^2-1}}{x} + C$

(2g) $\dfrac{4}{3}(x^2-4)^{3/2} + \dfrac{1}{5}(x^2-4)^{5/2} + C$;(2h) $\dfrac{9}{16}\sqrt{4x^2-9} + \dfrac{1}{48}(4x^2-9)^{3/2} + C$

(2 i) $\dfrac{\sqrt{5}}{8}$; (2 j) $\dfrac{\pi}{4\sqrt{2}}$; (2 k) $\dfrac{3}{2}\ln(x^2+1) + 4\arctan x + C$

(2 l) $\ln\left|\dfrac{x+\sqrt{x^2-4}}{2}\right| - \dfrac{\sqrt{x^2-4}}{x} + C$

(3 a) $\dfrac{x^2}{2}\arctan x - \dfrac{1}{2}x + \dfrac{1}{2}\arctan x + C$

(3 b) $\sqrt{4x^2-9} - 3\operatorname{arcsec}\left(\dfrac{2x}{3}\right) + C$

(3 c) $-25(25-x^2)^{1/2} + \dfrac{1}{3}(25-x^2)^{3/2} + C$; (3 d) $\dfrac{1}{3}\tan^3\theta - \tan\theta + \theta + C$

(3 e) $\dfrac{2}{5}(\tan\theta)^{5/2} + 2(\tan\theta)^{1/2} + C$; (3 f) $2x - \ln|x-2| - 2\ln|x+2| + C$

(3 g) $-2\ln|x+1| - \dfrac{3}{x+1} + \dfrac{5}{2}\ln|2x-1| + C$

(3 h) $\dfrac{1}{4}\ln\left|\dfrac{4-\sqrt{16-9x^2}}{3x}\right| + C$