2. Evaluate the following indefinite integrals (2.5 points each)

(a) $\int x^2 e^{x^3}\,dx$ Let u = x^3

$du = 3x^2\,dx$

$\frac{1}{3}\int e^{x^3}\, 3x^2\,dx$

$\frac{1}{3}\int e^{u}\,du = \frac{1}{3}e^{u}+c = \boxed{\frac{1}{3}e^{x^3}+c}$

(b) $\int \frac{e^{\sqrt{x}}}{\sqrt{x}}\,dx = \int e^{\cancel{x^{\frac{1}{2}}}}\, x^{-\frac{1}{2}}\,dx$ Let u = $\sqrt{x} = x^{\frac{1}{2}}$

$du = \frac{1}{2}x^{-\frac{1}{2}}\,dx$

$2\int e^{x^{\frac{1}{2}}}\,\frac{1}{2}x^{-\frac{1}{2}}\,dx$

$2\int e^{u}\,du = 2e^{u}+c = \boxed{2e^{\sqrt{x}}+c}$

(c) $\int \frac{e^x}{e^x+1}\,dx$ Let u = e^x+1

$du = e^x\,dx$

$= \int \frac{du}{u} = \ln u + c = \boxed{\ln(e^x+1)+c}$

(d) $\int e^{2x}\sqrt{e^{2x}+5}\,dx$ Let u = $e^{2x}+5$

$du = 2e^{2x}\,dx$

$\frac{1}{2}\int 2e^{2x}(u)^{\frac{1}{2}}\,dx$

$\frac{1}{2}\int u^{\frac{1}{2}}\,du = \frac{1}{2}\,\frac{u^{\frac{3}{2}}}{\frac{3}{2}}+c = \boxed{\frac{1}{3}(e^{2x}+5)^{\frac{3}{2}}+c}$

"Practice Quiz 1"

MA 182 Dr. Katiraie — Quiz 1 Form A — Sections 5.3, and 5.5

Name:______________________________

Please show your procedure — NO PROCEDURE = NO POINTS

1. Evaluate the following integrals. (2.5 points each)

(a) $\int_{1/2}^{\sqrt{3}/2} \frac{6}{\sqrt{1-t^2}}\,dt = 6\sin^{-1}(t)\Big|_{\frac{1}{2}}^{\frac{\sqrt{3}}{2}} =$

$= 6\sin^{-1}\left(\frac{\sqrt{3}}{2}\right) - 6\sin^{-1}\left(\frac{1}{2}\right)$

$= 6\left(\frac{\pi}{3}\right) - 6\left(\frac{\pi}{6}\right) = 2\pi - \pi = \boxed{\pi}$

(b) $\int_{1}^{64} \frac{1+\sqrt[3]{x}}{\sqrt{x}}\,dx = \int\left(x^{-\frac{1}{2}} + \frac{x^{\frac{1}{3}}}{x^{1/2}}\right)dx$

$= \int_1^{64}\left(x^{-\frac{1}{2}} + x^{-\frac{1}{6}}\right)dx = \frac{x^{\frac{1}{2}}}{\frac{1}{2}} + \frac{x^{\frac{5}{6}}}{\frac{5}{6}} = 2x^{\frac{1}{2}} + \frac{6}{5}x^{\frac{5}{6}}\Big|_1^{64}$

$\left(2(64)^{\frac{1}{2}} + \frac{6}{5}(64)^{\frac{5}{6}}\right) - \left(2 + \frac{6}{5}\right) = \boxed{51.2}$

(c) $\int_0^{\pi/4} \frac{1+\cos^2\theta}{\cos^2\theta}\,d\theta = \int \frac{1}{\cos^2\theta} + \frac{\cos^2\theta}{\cos^2\theta}\,d\theta$

$= \int(\sec^2\theta + 1)\,d\theta = \tan\theta + \theta\Big|_0^{\frac{\pi}{4}} =$

$\left(\tan\frac{\pi}{4} + \frac{\pi}{4}\right) - (\tan 0 - 0)$

$= \boxed{1 + \frac{\pi}{4}}$

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

$= \int\left(x + 1 + \frac{1}{x}\right)dx = \frac{x^2}{2} + x + \ln x\Big|_1^e \quad \boxed{\frac{e^2}{2} + e - \frac{1}{2}}$

$\left(\frac{e^2}{2} + e + \ln e\right) - \left(\frac{1}{2} + 1 + \cancel{\ln 1}\right) = \frac{e^2}{2} + e + \cancel{1} - \frac{1}{2} - \cancel{1}$