3/2/ Calc 2 Quiz 8

1 $\int \underbrace{e^{-x}}_{dv} \underbrace{\cos 3x}_{u} \, dx =$

$v = -e^{-x}$ $du = -3\sin 3x$

$-e^{-x}\cos 3x \, (-3) \int \underbrace{e^{-x}}_{dv} \underbrace{\sin 3x}_{u} \, dx$

$v = -e^{-x}$ $du = 3\cos 3x$

$-e^{-x}\sin 3x + \int +3e^{-x}\cos 3x$

$-e^{-x}\cos 3x + 3e^{-x}\sin 3x - 9\int e^{-x}\cos 3x \, dx$

$10\int e^{-x}\cos 3x =$

so $\int e^{-x}\cos 3x = \dfrac{-e^{-x}\cos 3x + 3e^{-x}\sin 3x}{10} + C$

Last time trig - subs $\sin\theta = \frac{x}{a}$

① $\sqrt{a^2 - x^2}$ ← $\boxed{x = a\sin\theta}$

$a\cos\theta$

② $\sqrt{a^2 + x^2}$ ← $x = a\tan\theta$

$a\sec\theta$

③ $\sqrt{x^2 - a^2}$ ← $x = a\sec\theta$

$a\tan\theta$

$\sec\theta = \frac{x}{a}$

Ex $\int \sqrt{e^{2x} - 16}\, dx = \int \sqrt{(e^x)^2 - 16}\, dx$

$u = e^x$

$du = e^x dx$

$\int \frac{\sqrt{(e^x)^2 - 16}\; e^x dx}{e^x} =$

$\int \frac{\sqrt{u^2 - 16}}{u}\, du$

$$\boxed{u = 4\sec\theta}$$

$$du = \underline{4\sec\theta\tan\theta\, d\theta}$$

$$\sqrt{} = 4\tan\theta$$

$$\int \frac{4\tan\theta}{\cancel{4}\cancel{\sec\theta}}\, \cancel{4}\cancel{\sec\theta}\tan\theta\, d\theta$$

$$\int 4\underbrace{\tan^2\theta}_{\sec^2\theta - 1}\, d\theta =$$

$$4\int \underline{\sec^2\theta} - 1\, d\theta =$$

$$4\tan\theta - 4\theta + C$$

$$\sec\theta = \frac{u}{4}$$

$$\cancel{4}\,\frac{\sqrt{u^2-16}}{\cancel{4}} - 4\underbrace{\arccos\frac{4}{u}} + C$$

$u = e^x$

$$\sqrt{e^{2x}-16} - 4\arccos\frac{4}{e^x} + C$$

Ex2 $$\int \frac{dx}{(x^2+4)^2} = \int \frac{dx}{\left(\sqrt{x^2+4}\right)^4}$$

$$\boxed{x = 2\tan\theta}$$

$$x^2+4 = 4\tan^2\theta + 4 = \underline{4\sec^2\theta}$$

$$\boxed{dx = 2\sec^2\theta\, d\theta}$$

$$\sqrt{} = 2\sec\theta$$

$$\int \frac{2\sec^2\theta\, d\theta}{16\sec^4\theta} =$$

$$\frac{1}{8}\int \frac{d\theta}{\sec^2\theta} = \frac{1}{8}\int \underbrace{\cos^2\theta}_{\frac{1+\cos 2\theta}{2}}\, d\theta$$

$$= \frac{1}{16}\int 1+\cos 2\theta\, d\theta$$

$\sin 2x = 2\sin x\cos x$

$$= \frac{1}{16}\left(\theta + \underline{\underline{\frac{1}{2}\sin 2\theta}}\right) + C$$

$$\shortparallel$$

$$\frac{1}{16}\left(\theta + \sin\theta\cos\theta\right) + C$$

$$\shortparallel$$

$x = 2\tan\theta$

$\frac{x}{2} = \tan\theta$

$$\frac{1}{16}\arctan\frac{x}{2} + \frac{1}{16}\frac{2x}{x^2+4} + C$$

$$\shortparallel$$

$$\frac{1}{16}\arctan\frac{x}{2} + \frac{1}{8}\frac{x}{x^2+4} + C$$

§8.4 Partial fractions

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

$$\shortparallel$$

$x = \sec\theta$

$dx = \underline{\sec\theta\tan\theta}$

$$\int \frac{2\sec\theta\,\cancel{\tan\theta}\,d\theta}{\tan^{\cancel{2}}\theta} =$$

$$\int \frac{2\sec\theta}{\tan\theta} = \int \frac{2\,d\theta}{\sin\theta} =$$

$$\int 2\csc\theta\,d\theta$$ <u>table</u>