

$$30. \int \frac{dx}{x\sqrt{4x^2+16}} = \int \frac{dx}{2x\sqrt{x^2+4}} \quad 7.4$$

$$x = 2 \tan \theta \quad dx = 2 \sec^2 \theta d\theta$$

$$= \int \frac{2 \sec^2 \theta d\theta}{2(2 \tan \theta) \sqrt{4 \tan^2 \theta + 4}}$$

$$= \int \frac{\sec \theta d\theta}{2 \tan \theta \cdot 2 \sec \theta} = \int \frac{\sec \theta d\theta}{4 \tan \theta}$$

$$= \int \frac{1}{4} \cdot \frac{1}{\cos \theta} \cdot \frac{\cos \theta}{\sin \theta} d\theta = \int \frac{1}{4} \cdot \frac{1}{\sin \theta} d\theta$$

$$= \int \frac{1}{4} \csc \theta d\theta = -\frac{1}{4} \ln |\csc \theta + \cot \theta| + C$$

$$= -\frac{1}{4} \ln \left| \frac{\sqrt{x^2+2}}{x} + \frac{2}{x} \right| + C$$

$$\int \frac{-\csc u du}{\csc u + \cot u} = \int \frac{dv}{v}$$

$$= \int \csc u du$$

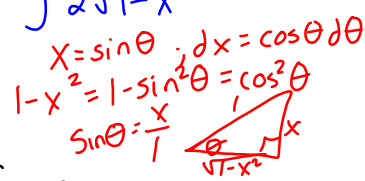
$$dv = \frac{-\csc u}{\csc u + \cot u} du$$

$\int \csc u du = -\ln |\csc u + \cot u|$
 $= \ln \left| \frac{1}{\csc u + \cot u} \right|$
 $V = \frac{1}{\csc u + \cot u}$
 $dv = \frac{-1}{(\csc u + \cot u)^2} \cdot (-\csc u \cot u - \csc^2 u)$
 $= \frac{-\csc u (\cot u + \csc u)}{(\csc u + \cot u)^2}$

40. $\int x \arcsin x dx$

$u = \arcsin x \quad dv = x dx$
 $du = \frac{1 dx}{\sqrt{1-x^2}} \quad v = \frac{1}{2} x^2$

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



$$= \frac{1}{2} x^2 \arcsin x - \int \frac{\sin^2 \theta \cdot \cos \theta d\theta}{2 \cos \theta}$$

$$= \frac{1}{2} x^2 \arcsin x - \int \frac{1}{2} \sin^2 \theta d\theta$$

$\cos 2\theta = 1 - 2\sin^2 \theta$
 $\sin^2 \theta = \frac{1 - \cos 2\theta}{2}$

$$= \frac{1}{2} x^2 \arcsin x - \int \frac{1}{4} (1 - \cos 2\theta) d\theta$$

$$= \frac{1}{2} x^2 \arcsin x - \frac{1}{4} \theta + \frac{1}{8} \sin 2\theta + C$$

$$= \frac{1}{2} x^2 \arcsin x - \frac{1}{4} \arcsin x + \frac{1}{8} \cdot 2 \sin \theta \cos \theta + C$$

$$= \frac{1}{2} x^2 \arcsin x - \frac{1}{4} \arcsin x + \frac{1}{4} x \sqrt{1-x^2} + C$$

Test 3

(tentatively)

Wed. 01/29

$$6. \int e^x \cos x \, dx$$

$$u = \cos x \quad dv = e^x dx$$

$$du = -\sin x \, dx \quad v = e^x$$

$$\int = e^x \cos x + \int e^x \sin x \, dx$$

$$u = \sin x \quad dv = e^x dx$$

$$du = \cos x \, dx \quad v = e^x$$

$$\int e^x \cos x \, dx = e^x \cos x + e^x \sin x - \int e^x \cos x \, dx$$

$$2 \int e^x \cos x \, dx = e^x \cos x + e^x \sin x$$

$$\int e^x \cos x \, dx = \boxed{\frac{e^x \cos x + e^x \sin x}{2} + C}$$

$$8. \int \sin^2 x \cos^2 x dx$$

$$= \int (1 - \cos^2 x) \cos^2 x dx$$

$$= \int \cos^2 x dx - \int \cos^4 x dx$$

$$\cos 2\theta = 2\cos^2 \theta - 1$$

$$\frac{\cos 2\theta + 1}{2} = \cos^2 \theta$$

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Homework:

- 6.1 #1-9 odd; 19, 43 (area between curves)
- 6.2 #11, 13, 17, 19, 21, 25, 29, 35 (volume of solid of revolution)
- 6.4 #5, 7, 13, 33, 35 (arc length and surface of revolution)
- 7.1 #5-53 odd (basic integration rules)
- 7.2 #1-35 odd (integration by parts)
- 7.3 #3-15 odd; 21-37 odd; 47-67 odd (trigonometric integrals)
- 7.4 #5-15 odd; 19-43 odd (trigonometric substitution)