Math 187 – Quiz #2 Formula Sheet

Volume

disk: $dV = \pi r^2 dt$

shell: $dV = 2\pi r\, h\, dt$

Centroid/Centre of Mass

thin, uniform plate: $\bar{x} = \frac{1}{A}\int_A x_e\, dA$ $\bar{y} = \frac{1}{A}\int_A y_e\, dA$ for thin slice of area dA

volume of revolution: $\bar{x} = \frac{1}{V}\int_V x_e\, dV$ $\bar{y} = \frac{1}{V}\int_V y_e\, dV$ for disk of volume dV

where (x_e, y_e) are the coordinates of the centre-of-mass of the slice/disk

Moments of Inertia

thin, uniform plate: $I = \int_V r^2 dm = \rho t \int_A r^2 dA$ for area dA a distance r from the axis

volume of revolution: $I = \int_V r^2 dm = \rho \int_V r^2 dV$ for shell with volume dV at r from axis

radius of gyration: $R = \sqrt{\frac{I}{m}}$ where $m = \rho V$ (for thin plate, $m = \rho A t$)

Arc length of a curve $s = \int_a^b \sqrt{1 + \left(\frac{dy}{dx}\right)^2}\, dx$

Surface area of a volume of revolution $A = 2\pi \int_a^b y \sqrt{1 + \left(\frac{dy}{dx}\right)^2}\, dx$

Average value of a function $y_{av} = \frac{1}{b-a}\int_a^b y\, dx$

Trig Integration

$$\int \tan x\,dx = -\ln|\cos x| + C = \ln|\sec x| + C$$

$$\int \cot x\,dx = \ln|\sin x| + C \quad (\text{textbook}) = -\ln|\csc x| + C \ (\text{Gilles' materials})$$

$$\int \sec x\,dx = \ln|\sec x + \tan x| + C$$

$$\int \csc x\,dx = \ln|\csc x - \cot x| + C \quad (\text{textbook}) = -\ln|\csc x + \cot x| + C \ (\text{Gilles'materials})$$

$$\int \sec^2 x\,dx = \tan x + C$$

$$\int \csc^2 x\,dx = -\cot x + C$$

$$\int \sec x \tan x\,dx = \sec x + C$$

$$\int \csc x \cot x\,dx = -\csc x + C$$

$$\int \frac{dx}{\sqrt{a^2 - x^2}} = \sin^{-1}\left(\frac{x}{a}\right) + C$$

$$\int \frac{dx}{a^2 + x^2} = \frac{1}{a}\tan^{-1}\left(\frac{x}{a}\right) + C$$

Trigonometry Identities

$$\sin^2\theta + \cos^2\theta = 1$$

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

$$\sin 2\theta = 2\sin\theta\cos\theta$$

$$1 + \tan^2\theta = \sec^2\theta$$

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

$$\cot^2\theta + 1 = \csc^2\theta$$