Name_____

MATH 172 Quiz 1 Spring 2018

Sections 501-502 (circle one) Solutions P. Yasskin

1	/4	3	/4
2	/6	4	/6
		Total	/20

1. Find the mass of a 5 cm bar with linear density $\rho(x) = x^3 \ \frac{\text{gm}}{\text{cm}}$ where x is measured from one end.

Solution: $M = \int \rho(x)\,dx = \int_0^5 x^3\,dx = \left[\frac{x^4}{4}\right]_0^5 = \frac{5^4}{4} = \frac{625}{4}$ gm

2. Find the center of mass of a 5 cm bar with linear density $\rho = x^3 \ \frac{\text{gm}}{\text{cm}}$ where x is measured from one end.

Solution: $M_1 = \int x\rho(x)\,dx = \int_0^5 x^4\,dx = \left[\frac{x^5}{5}\right]_0^5 = \frac{5^5}{5} = 625$ gm-cm

$\bar{x} = \frac{M_1}{M} = \frac{625}{1}\frac{4}{625} = 4$ cm

3. Complete each of these identities.

The first two are in terms of $\sin(A)$, $\cos(A)$, $\sin(B)$ and/or $\cos(B)$:

Solutions:

a. $\sin(A+B) =$ $\sin(A)\cos(B) + \cos(A)\sin(B)$

b. $\cos(A+B) =$ $\cos(A)\cos(B) - \sin(A)\sin(B)$

The last two are in terms of $\sin(2A)$ and/or $\cos(2A)$:

c. $\sin^2(A) =$ $\frac{1-\cos(2A)}{2}$

d. $\cos^2(A) =$ $\frac{1+\cos(2A)}{2}$

4. Compute: $\int x^5 \ln x\,dx$. Check your answer.

Solution: Use the Parts: $u = \ln x$, $dv = x^5\,dx$; $du = \frac{1}{x}\,dx$, $v = \frac{x^6}{6}$

$$\int x^5 \ln x\,dx = \frac{x^6}{6}\ln x - \frac{1}{6}\int x^6 \frac{1}{x}\,dx = \frac{x^6}{6}\ln x - \frac{1}{6}\int x^5\,dx = \frac{x^6}{6}\ln x - \frac{x^6}{36} + C$$

Check: $\frac{d}{dx}\left(\frac{x^6}{6}\ln x - \frac{x^6}{36}\right) = x^5\ln x + \frac{x^6}{6}\frac{1}{x} - \frac{6x^5}{36} = x^5\ln x$