

MSLC – Math 1172 Exam 1 Review

1) Find the following integrals:

a. $\int \frac{\sec^2 x}{\tan^6 x} dx$

b. $\int (\cos(2\theta) - 2\sin\theta) d\theta$

c. $\int \frac{\cos(\sqrt{x})}{\sqrt{x}} dx$

d. $\int_{-2}^2 |x+1| e^{(x+1)^2} dx$

e. $\int \frac{2}{x(\ln x^2)^2} dx$

f. $\int x^4 (\ln(x))^2 dx$

g. $\int \frac{x+2}{x^2+4} dx$

h. $\int (2x-1)e^{(2x-1)} dx$

i. $\int \frac{\ln(x)}{x^2} dx$

j. $\int \frac{x}{\sqrt[3]{x-1}} dx$

k. $\int \frac{x^3}{\sqrt{4x^2+9}} dx$

l. $\int x^{1/2}(x^{3/2} - 2x) dx$

m. $\int \frac{e^x}{1+e^{2x}} dx$

n. $\int \sin^2(x) dx$

o. $\int \sin^4(t) dt$ Hint: $\sin^4 t = (\sin^2 t)^2$

2) a. Find the area between the graphs of $y = 3x^3 - x^2 - 10x$ and $y = -x^2 + 2x$.

b. Find the area between the graphs of $y = x - 1$ and $y^2 = 3 - x$.

c. Consider the functions $y = -3x$, $y = -x^2 + 10$, and $y = x\sqrt{x^2 + 5}$. Calculate the area contained between the functions that exists above the x-axis.

3) Consider the area bounded by $f(x)$, $g(x)$, $x=0$, and $x=5$.

The following table gives some of the values of the functions $f(x)$ and $g(x)$.

x	0	1	2	3	4	5
$f(x)$	10	45/4	11	41/4	11	49/4
$g(x)$	1	5/4	2	13/4	5	29/4

For each calculation, write down the desired integral and the appropriate approximating Riemann Sum using proper sigma notation. Then calculate the sum.

a) Using a Right Riemann Sum, calculate the approximate volume of the solid whose base is the above area and whose cross sections perpendicular to the x -axis are semicircles.

b) Using a Right Riemann Sum and the above area, calculate the approximate volume of the solid formed by making a rotation about the line $y = -1$ (use the disk method for this).

c) Using a Right Riemann Sum and the above area, calculate the approximate volume of the solid formed by making a rotation about the line $x = 6$ (use the shell method for this).

4) Consider the region bounded by $y = \ln x$, $y = 0$ and $x = e^2$. Set up the integral for the volume of the solid obtained by rotating the region about the:

a) x -axis using both the disk and shell methods

b) y -axis using both the disk and shell methods

5) Compute the volume of the solid with a base bounded by $y = \frac{1}{2}x^2$, $y = -\frac{1}{2}x^2$, and $x = 10$ and with cross sections perpendicular to the x -axis being equilateral triangles.

- 6) Consider the region bounded by $y = \sin(\pi x)$ and the x -axis between $x=0$ and $x=1$. **Set up** the integral for the volume obtained if:
- The region is rotated about the x -axis
 - The region is rotated about the y -axis
 - The region is rotated about the line $x=10$
 - The region is rotated about the line $y=2$
- 7) A force of 12N is required to stretch a spring from its natural length of 15m to a length of 21m.
- What is the spring constant k ?
 - How much work is required to stretch the spring from 21m to 25m?
- 8) A whirlpool has the shape of a half-sphere of radius 4ft. How much work is required to empty the pool by pumping water over the top edge? Assume the density of water is 62.5 lb/ft^3 .