

Math 1B

Midterm 3 Review

Let P be the region bounded by $y = 6x - x^2$ and $y = x + 4$.

Let Q be the region bounded by $y = 2x^2$ and $y = x^2 + 4$.

Let R be the region bounded by $x = 0$, $y = x - 1$ and $y = 2 - 2x$.

Let S be the region bounded by $x = y^2 - 1$ and $y = x - 1$.

Let T be the region bounded by $y = e^x$, $y = 2$ and $x = 0$.

Let U be the region bounded by $y = 2 \ln x$, $y = 0$, $x = 0$ and $y = 2$.

Complete the following tables.

		VOLUME OF SOLID IF REGION IS REVOLVED AROUND					
REGION	AREA	$x = -3$	$x = 5$	$y = -1$	$y = 10$		
P							
Q							
REGION	AREA	$x = 0$	$x = -2$	$x = 3$	$y = -1$	$y = 2$	$y = 3$
R							
S							
T							
U							

	VOLUME IF REGION IS BASE OF SOLID AND CROSS SECTIONS PERPENDICULAR TO X-AXIS ARE		
REGION	SQUARES	SEMICIRCLES	EQUILATERAL TRIANGLES
P			
Q			
R			
T			

- [1] Find the area of the region between $y = x^2$ and $y = 2x + 3$ on $[0, 4]$.
- [2] Find the area of the region between $y = 4 - x^2$ and $y = x^2 - 2x$ on $[0, 4]$.
- [3] Find the length of the curve $y = \frac{1}{8}x^4 + \frac{1}{4x^2}$ on $[1, 2]$.
- [4] Find the length of the curve $y = e^{2x} + \frac{1}{16e^{2x}}$ on $[0, 1]$.
- [5] Find the length of the curve $y = \int_2^x \sqrt{t^2 - 2t} \, dt$ on $[2, 5]$.
- [6] Find the length of the curve $y = \int_0^x \sqrt{(t+1)(t+3)} \, dt$ on $[0, 2]$.
- [7] Use your calculator to find the area of the surface generated by revolving $y = \frac{1}{x}$ on $[1, 4]$ around the x-axis.
- [8] Use your calculator to find the area of the surface generated by revolving $y = \ln x$ on $[1, 4]$ around the x-axis.
- [9] A spherical tank of radius 4 feet containing water is buried underground, so that its center is 8 feet below ground level.
 - [a] Find the work done in pumping the water to ground level
 - [i] if the tank is full.
 - [ii] if the tank is half full.
 - [b] Find the work done in pumping the top half of the water to ground level if the tank is full.
- [10] Find the hydrostatic force on the window of an aquarium
 - [a] if the window is a circle of radius 1 foot with the center 10 feet below the surface of the water
 - [b] if the window is a semicircle of radius 1 foot with the flat side up and 10 feet below the surface of the water
 - [c] if the window is a triangle of height 1 foot and base 2 feet with the base up and 10 feet below the surface of the water
 - [d] if the window is a triangle of height 1 foot and base 2 feet with the base down and 10 feet below the surface of the water
- [11] If $f(x) = \frac{k}{x^2}$ is a probability density function for the random variable X on $[1, 5]$,
 - [a] find the value of k
 - [b] find $P(2 < X \leq 4)$
 - [c] find the mean value of X
 - [d] find the median value of X
- [12] If $f(x) = kx^2$ is a probability density function for the random variable X on $[1, 5]$,
 - [a] find the value of k
 - [b] find $P(2 < X \leq 4)$
 - [c] find the mean value of X
 - [d] find the median value of X