**Unit 8**

**Integration Applications**

Topics Covered:

* Average Function Value & Mean Value Theorem
* Area Between 2 Curves
* Volume by Known Cross Sections
* Volumes of Revolutions – Disk & Washer Method

Quiz is \_\_\_\_\_\_\_\_\_\_\_\_\_\_

Test is \_\_\_\_\_\_\_\_\_\_\_\_\_\_

Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Average Function Value/Mean Value Theorem

For each problem, find the average value of the function over the given interval.

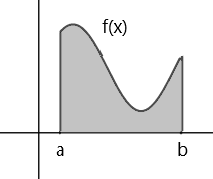
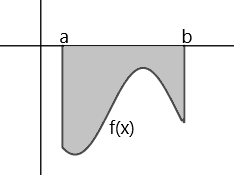
|  |  |  |  |
| --- | --- | --- | --- |
| 1. |  | 2. |  |
| 3. |  | 4. |  |
| 5. |  | 6. |  |

**For each problem, find the values of c that satisfy the Mean Value Theorem for Integrals.**

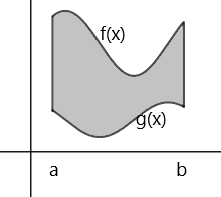
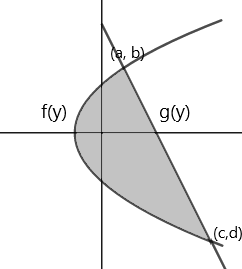
|  |  |  |  |
| --- | --- | --- | --- |
| 7. |  | 8. |  |
| 9. |  | 10. |  |

**Area Between Curves Introduction Worksheet**

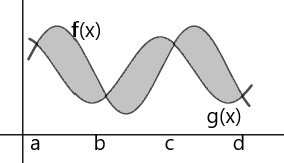
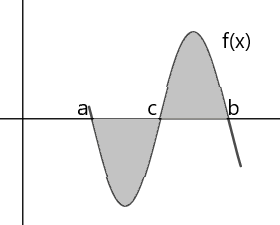
Draw the arbitrary rectangle and set up the integral to find the area for the shaded region.

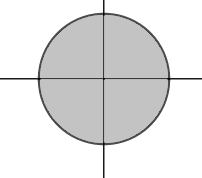
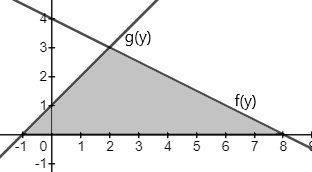


1. 2.



3. 4.

5. 6.



7. 8.

**Area between Two Curves**

Compute the area of the shaded region.

|  |  |
| --- | --- |
| 1. |  |
| 2. |  |
| 3. |  |

**Compute the area of the region enclosed by the given curves.**

|  |  |  |  |
| --- | --- | --- | --- |
| 4. |  | 5. |  |
| 6. |  | 7. |  |

**Area between Curves 2**

**Find the area of the shaded region analytically.**

|  |  |  |  |
| --- | --- | --- | --- |
| 1. |  | 2. |  |
| 3. |  | 4. |  |
| 5. |  | 6. |  |
| 7. | Find the area of the region(s) enclosed by the graphs of and | 8. | Find the area of the region(s) enclosed by the graphs of and from to |

**Volumes with Cross Sections**

1. The base of a solid is bounded by , the x-axis, and the y-axis. Cross sections that are perpendicular to the x-axis are isosceles right triangles with the right angle on the x-axis. (Legs perpendicular to the x-axis). Find the volume.

2. The base of a solid is bounded by the semi-circle  & the x-axis. Cross sections that are perpendicular to the x-axis are squares. Find the volume.

3. The base of a solid is bounded by  , the positive x-axis & the positive y-axis. Cross sections that are perpendicular to the y-axis are isosceles right triangles. Find the volume.

4. The base of a solid is a circular region in the xy-plane bounded by the graph . Find the volume of the solid if every cross section by a plane normal to the x-axis is a semi-circle.

5. The base of a solid is circular region in the xy-plane bounded by the graph of . Find the volume of the solid if every cross section by a plane normal to the x-axis is a square with one side as the base.

6. The base of a solid is bounded by , the x-axis, and the y-axis. Cross sections that are perpendicular to the y-axis are semi-circles. Find the volume.

**Find the Volumes of Revolution: Disk Method**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 1. | about the x-axis |  | 2. | about the x-axis |
| 3. | (in the 1st quadrant) about the x-axis |  | 4. | (in the 1st quadrant) about the y-axis |
| 5. | (in the 1st quadrant) about the x-axis |  | 6. | about the y-axis |
| 7. | about the y-axis |  | 8. | about the x-axis |

**Find the Volumes of Revolution: Washer Method**

|  |  |  |  |
| --- | --- | --- | --- |
| 1. | about the x-axis | 2. | about the y-axis |
| 3. | about the y-axis | 4 | about the y-axis |
| 5. | about the x-axis | 6. | about the y-axis |
| 7. | about the | 8. | about the x-axis |

**Unit 7 Integration Applications Review**

**Find the average value of the function over the interval:**

|  |  |  |  |
| --- | --- | --- | --- |
| 1. |  | 2. |  |

**Find the value of c guaranteed by the Mean Value Theorem:**

|  |  |  |  |
| --- | --- | --- | --- |
| 3. |  | 4. |  |

**Determine the area of the bounded region:**

|  |  |  |  |
| --- | --- | --- | --- |
| 5. |  | 6. |  |
| 7. |  | 8. |  |
| 9. |  | 10. |  |
| 11. |  | 12. |  |

**Find the volume by cross sections:**

13. The base of a solid is the region enclosed by the circle . If cross sections are built up perpendicular to the x-axis, find the volume of the solid created if the cross sections are:

a) squares

b) isosceles right triangles set on the hypotenuse

c) What if cross sections are perpendicular to the y-axis and are semi-circles?

14. The base of a solid is the region between y = 4 – x2 , x=0, y=0. If cross sections are perpendicular to the y-axis and are semicircles, find the volume.

15. Find the volume of the region generated by and the x-axis. The cross sections are perpendicular to the x-axis:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| a. | Squares | b. | Isosceles triangles | c. | Semi Circles |

16. Find the volume of the region generated by The cross sections are perpendicular to the y-axis:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| a. | Squares | b. | Isosceles triangles | c. | Semi Circles |

17. Find the volume of the region generated by . The cross sections are perpendicular to the x-axis. The cross sections are rectangles with a height twice the base.

**Find the volume of the revolution.**

Draw the graph, draw the arbitrary cross section, set upthe integral, & find the volume.

18. , y = 0, x = 0 and x = 2

a. about the x axis.

b. about the y-axis:

19.

a. about the x-axis.

b. about the y-axis.

Find the volume of the solid generated by revolving the plane region bounded by the indicated equations:

20.

1. x-axis
2. y-axis

21.

1. x-axis
2. y-axis

22. about the x-axis