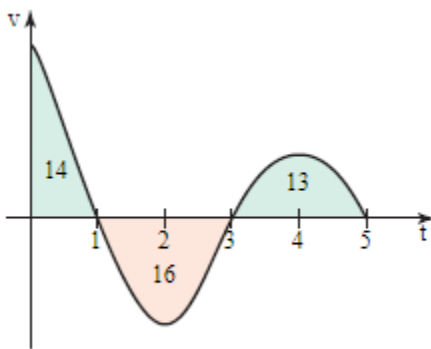


Calculus II, Exam 1 Review

Please keep in mind that this is a general review of topics to study. It is not meant to be all-inclusive.

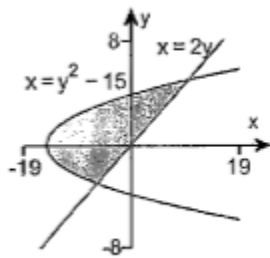
- Chapter 6 -

1. Consider the graph shown in the figure, which gives the velocity of an object moving along a line. Assume time is measured in hours and distance is measured in miles. The areas of three regions bounded by the velocity curve and the t -axis are also given. Complete parts a – e.



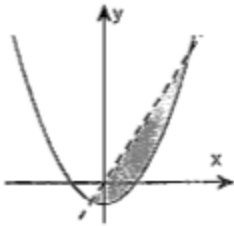
- On what interval(s) is the object moving in the positive direction?
 - What is the displacement of the object over the interval $[0, 3]$?
 - What is the total distance traveled by the object over the interval $[0, 5]$?
 - What is the displacement of the object over the interval $[0, 5]$?
 - Describe the position of the object relative to its initial position after 5 hours.
2. The function $v(t) = t^3 - 8t^2 + 15t$ on the interval $[0, 7]$ is the velocity in m/sec of a particle moving along the x -axis. Complete parts a-c.
- Determine when the motion is in the positive direction and when it is in the negative direction.
 - Find the displacement over the given interval
 - Find the distance traveled over the given interval.

3. Determine the area of the shaded region in the given figure.



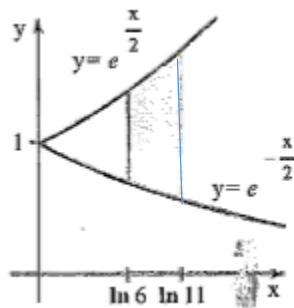
4. Find the area of the region bounded by $y = e^x$, $y = e^{-2x}$, and $x = \ln 3$. Give an exact answer.

5. Determine the area of the shaded region below.
The region is bounded by $y = x^2 - 7$ and $y = 6x$. Give an exact answer



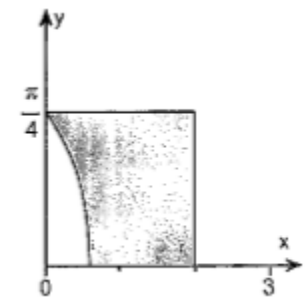
6. Let R be the region bounded by the graphs of $y = 5 - 2x$, $y = 0$, and $x = 0$. Find the volume of the solid generated by revolving the region about the x-axis. (Give an exact answer)

7. Let R be the region bounded by the following curves. Find the volume of the solid generated when R is revolved about the x-axis.
 $y = e^{\frac{x}{2}}$, $y = e^{-\frac{x}{2}}$, $x = \ln 6$ and $x = \ln 11$. Give an exact answer



8. Find the volume of the solid generated when R (shaded region) is revolved about the given line.

$y = 2 - \sqrt{2} \sec x$, $x = 2$, $y = \frac{\pi}{4}$ and $y = 0$; about $x = 2$



9. Let R be the region bounded by the following curves. Use the shell method to find the volume of the solid generated when R is revolved about the x-axis. (Give an exact answer)

$$y = 19 - x, y = x, y = 0$$

10. Let R be the region bounded by the following curve. Find the volume of the solid generated when R is revolved about the y-axis. (exact answer)

$$y = \frac{e^x}{4x}, y = 0, x = 1, \text{ and } x = 5$$

11. Let R be the region bounded by the curves $y = 15x$, $y=15$, and $x=0$. Find the volume of the solid generated when R is revolved about the y-axis.

12. Let R be the region bounded by $y = x^2$, $x = 1$, and $y = 0$. Find the volume of the solid generated when R is revolved about the line $x=13$

13. Use both washer and shell methods to find the volume of the solid that is generated when the region in the first quadrant bounded by $y = x^2$, $y=25$, and $x=0$ is revolved about the line $x=t$.

- Set up the integral that gives the volume using disk/washer method
- Set up the integral that gives the volume using shell method
- Volume = _____ (Give an exact answer)

14. Let R be the region bounded by the curves $y = 3x^2$, and $y = 4 - x^2$. Use the method of your choice to find the volume of the solid generated when the region is revolved about the x-axis.

15. Let R be the region bounded by the following curves. Use the method of your choice to find the volume generated when R is revolved about the y-axis. $y = x$, $y = 3x + 3$, $x = 2$, and $x = 6$.

16. Find the arc length of the curve below on the given interval

$$y = \frac{3}{4}x^{4/3} - \frac{3}{8}x^{2/3} + 9 \text{ on } [1, 27]$$

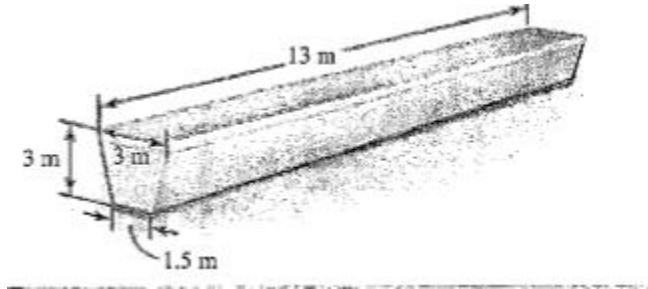
17. Find the area of the surface generated when the given curve is revolved about the given axis.

$$y = \frac{x^3}{17} \text{ for } 0 \leq x \leq \sqrt{17}$$

- Chapter 7 -

18. Suppose a force of 60N is required to stretch and hold a spring 0.1m from its equilibrium position.
- Assuming the spring obeys Hooke's law, find the spring constant k .
 - How much work is required to compress the spring 0.2 m from its equilibrium position?
 - how much work is required to stretch the spring 0.5 m from its equilibrium position?
 - How much additional work is required to stretch the spring 0.1 m if it has already been stretched 0.1 m from equilibrium?
19. A swimming pool has the shape of a box with a base that measures 24m by 18 m and a uniform depth of 2.9m. How much work is required to pump the water out of the pool when it is full? Use 1000 kg/m^3 for the density of water and 9.8 m/s^2 for the acceleration due to gravity.
20. A cylindrical tank has height 8 m and radius 4m.
- If the tank is full of water, how much work is required to pump the water to the level of the top of the tank? Use 1000 kg/m^3 for the density of water and 9.8 m/s^2 for the acceleration due to gravity.
 - Is it true that it takes half as much work to pump the water out of the tank when it is half-full as when it is full? Explain.

21. A trough has a trapezoidal cross section with a height of 3 m and horizontal sides of width $\frac{3}{2}$ m and 3 m. Assume the length of the trough is 13 m. See the figure below. Complete parts a and b.
- How much work is required to pump the water out of the trough (to the level of the top of the trough) when it is full? Use 1000 kg/m^3 for the density of water and 9.8 m/s^2 for the acceleration due to gravity.
 - If the length is doubled is the required work doubled?



22. Suppose that \$4000 is deposited in a savings account that increases exponentially. Determine the APY if the account increases to \$4800 in 4 years. Assume the interest rate remains constant and no additional deposits or withdrawals are made.
23. Uranium 238 has a half-life of 4.5 billion years. Geologists find a rock containing a mixture of U-238 and lead and they determine that 85% of the original U-238 remains; the other 15% has decayed into lead. How old is the rock?

$$\frac{x^2}{5} - \frac{y^2}{3} = 1$$