The Governor's School @ Innovation Park
A STEM INITIATIVE IN COLLABORATION WITH GEORGE MASON UNIVERSITY

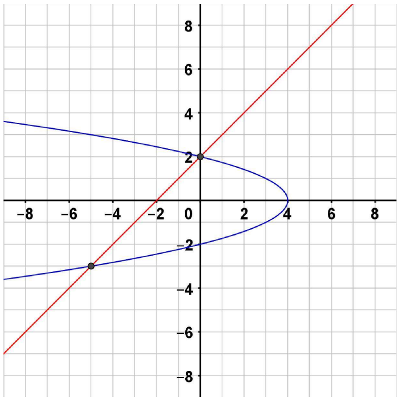
Name

Summer Assignment for Calc III (M215)

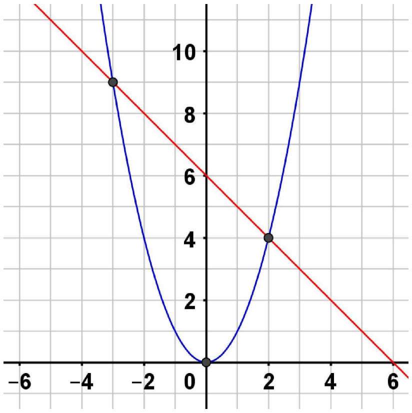
Find the area of the region between the two functions by integrating

- ***(a)*** *with respect to x and*
- ***(b)*** *with respect to y.*
- ***(c)*** *Compare your results. Which method is simpler?*

1. $x = 4 - y^2, \quad x = y - 2$



2. $y = x^2, \quad y = 6 - x$



Find the volumes of the solids generated by revolving the region bounded by the graphs of the equations about the given lines.

3. $y = 2x^2, \quad y = 0, \quad x = 2$

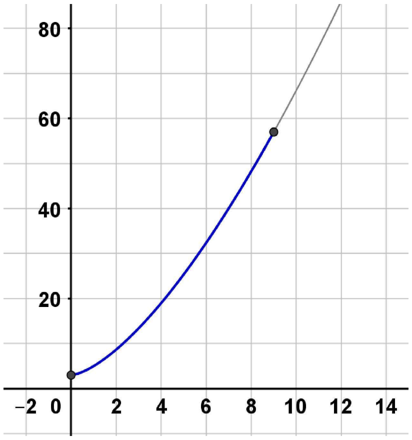
(a) the y-axis
(b) the x-axis
(c) the line $y = 8$
(d) the line $x = 2$

Set up an integral for the length of the curve.

4. $y = x^4, \quad 0 \le x \le 1$

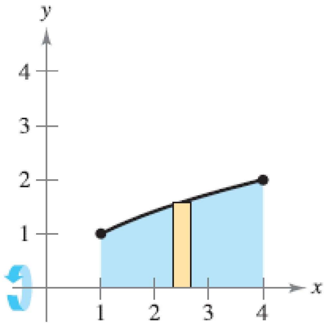
Find the arc length of the graph of the function over the indicated interval. You can use a calculator to calculate the final value - but you need to show all your work (i.e. don't evaluate the integral using the calculator)

5. $y = 2x^{\frac{3}{2}} + 3 \qquad 0 \le x \le 9$

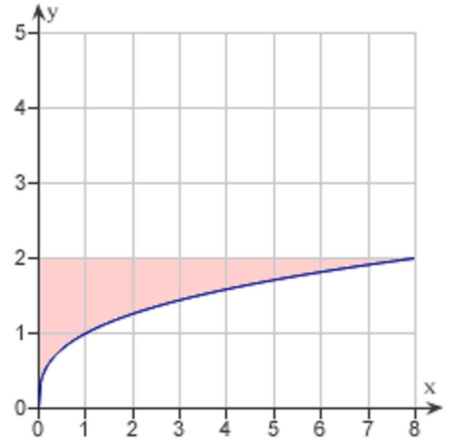


Set up and evaluate the integral that gives the volume of the solid formed by revolving the region about the x-axis.

6. $y = \sqrt{x}$



7. The graph of the function $g(y) = y^3$ is given below. Set up the definite integral that yields the area of the shaded region.

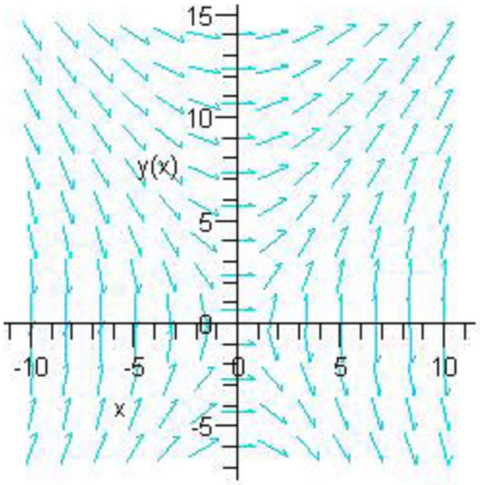


8. Find the general solution to the differential equation.

$$\frac{df}{dz} = 4z + \frac{3z}{\sqrt{4 - z^2}}$$

9. Find the indefinite integral $\int 3x^2 \cos x^3 \, dx$.

10. Use the differential equation $\dfrac{dy}{dx} = \dfrac{2x}{y}$ and its slope field to find the slope at the point $(4, 8)$.



11. Find the indefinite integral.

$$\int x^4 \ln x \, dx$$

12. Find the indefinite integral.

$$\int \cos^3 3x dx$$

Find a set of parametric equations for the line or conic.

13. Line passes through $(1, 4)$ and $(5, -2)$

14. Circle: center $(-6, 2)$; radius: 4.

Plot the point in polar coordinates and find the corresponding rectangular coordinates for the point.

15. $\left(8, \frac{\pi}{2}\right)$

16. $\left(-4, \frac{-3\pi}{4}\right)$

Convert the polar equation to rectangular form and sketch its graph.

17. $r = 3\sin\theta$

18. $\theta = \frac{5\pi}{6}$

Convert the rectangular equation to polar form and sketch its graph.

19. $x^2 - y^2 = 9$

20. $3x - y + 2 = 0$

21. Graph & find the area of the region shared by the circle $r = 5$ and the cardioid $r = 5(1 + \sin\theta)$

22. Write the corresponding rectangular equation for the curve represented by the parametric equations $x = 7 + \frac{2}{t}$, $y = t - 9$ by eliminating the parameter.

23. Find $\frac{dy}{dx}$.

$x = \sqrt[12]{t}$

$y = 6 - t$

24. Find the vector **v** whose initial and terminal points are given below.

(6,3), (10,–2)

25. Given $\mathbf{u} = \langle 6, 12 \rangle$ and $\mathbf{v} = \langle 3, -12 \rangle$, find $2\mathbf{u} + 5\mathbf{v}$.