

# Questions: Area between two curves

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## Summary

A selection of questions for the study guide on the area between two curves.

*Before attempting these questions, it is highly recommended that you read [Guide: Area between two curves].*

## Q1

Calculate the area of the shaded region between the following graphs and the  $x$ -axis.

1.1. *Insert figure of the graph of  $y = x^3$  with shaded region between  $x = 0$  and  $x = 2$  bounded by the graph and the  $x$ -axis.*

1.2. *Insert figure of the graph of  $y = \sqrt{4-x}$  with shaded region between  $x = 0$  and  $x = 4$  bounded by the graph and the  $x$ -axis.*

1.3. *Insert figure of the graph of  $y = \sqrt{2x}$  with shaded region between  $x = 0$  and  $x = 2$  bounded by the graph and the  $x$ -axis.*

1.4. *Insert figure of the graph of  $y = 2 - x$  with shaded region between  $x = 0$  and  $x = 2$  bounded by the graph and the  $x$ -axis.*

1.5. *Insert figure of the graph of  $y = \frac{1}{x}$  with shaded region between  $x = 1$  and  $x = 2$  bounded by the graph and the  $x$ -axis.*

1.6. *Insert figure of the graph of  $y = x^2 - 2$  with shaded region between  $x = -\sqrt{2}$  and  $x = \sqrt{2}$  bounded by the  $x$ -axis and the graph.*

1.7. *Insert figure of the graph of  $y = 2x - x^2$  with shaded region between  $x = 0$  and  $x = 2$  bounded by the graph and the  $x$ -axis.*

1.8. *Insert figure of the graph of  $y = x(x-1)$  with shaded region between  $x = 0$  and  $x = 1$  bounded by the  $x$ -axis and the graph.*

1.9. *Insert figure of the graph of  $y = x^3 - x$  with shaded region between  $x = 0$  and  $x = 1$  bounded by the graph and the  $x$ -axis.*

1.10. *Insert figure of the graph of  $y = 1 - \frac{x^2}{4}$  with shaded region between  $x = -2$  and  $x = 2$  bounded by the graph and the  $x$ -axis.*

## Q2

Calculate the area of the shaded region between the following trigonometric graphs and the  $x$ -axis.

2.1. Insert figure of the graph of  $y = \sin(x)$  with shaded region between  $x = 0$  and  $x = \pi$  bounded by the graph and the  $x$ -axis.

2.2. Insert figure of the graph of  $y = \cos(x)$  with shaded region between  $x = \frac{\pi}{2}$  and  $x = \frac{3\pi}{2}$  bounded by the graph and the  $x$ -axis.

2.3. Insert figure of the graph of  $y = \cos(2x)$  with shaded region between  $x = 0$  and  $x = \frac{\pi}{2}$  bounded by the graph and the  $x$ -axis.

2.4. Insert figure of the graph of  $y = \sin(2x)$  with shaded region between  $x = 0$  and  $x = \pi$  bounded by the graph and the  $x$ -axis.

2.5. Insert figure of the graph of  $y = \sin(3x)$  with shaded region between  $x = 0$  and  $x = \frac{\pi}{3}$  bounded by the graph and the  $x$ -axis.

2.6. Insert figure of the graph of  $y = \sin(3x)$  with shaded region between  $x = 0$  and  $x = \frac{\pi}{2}$  bounded by the graph and the  $x$ -axis.

2.7. Insert figure of the graph of  $y = \cos(2x)$  with shaded region between  $x = \frac{\pi}{4}$  and  $x = \frac{5\pi}{4}$  bounded by the graph and the  $x$ -axis.

2.8. Insert figure of the graph of  $y = \sin(2x)$  with shaded region between  $x = \frac{\pi}{4}$  and  $x = \frac{3\pi}{4}$  bounded by the graph and the  $x$ -axis.

2.9. Insert figure of the graph of  $y = \sin(2x)$  with shaded region between  $x = \frac{\pi}{8}$  and  $x = \frac{3\pi}{4}$  bounded by the graph and the  $x$ -axis.

## Q3

Calculate the area of the region enclosed by the following lines and curves.

3.1. Insert figure of the graph of  $y = 5x - 2x^2$  and  $y = \frac{1}{2}x^2$  with shaded region between  $x = 0$  and  $x = 2$  bounded above by  $y = 5x - 2x^2$  and below by  $y = \frac{1}{2}x^2$ .

3.2. Insert figure of the graph of  $y = \sqrt{x} - 1$  and  $y = \left(\frac{1}{3}x - 1\right)^2 - 2$  with shaded region between  $x = 0$  and  $x = 9$  bounded above by  $y = \sqrt{x} - 1$  and below by  $y = \left(\frac{1}{3}x - 1\right)^2 - 2$ .

3.3.  $y = x^2$  and  $y = 2x + 3$ .

3.4.  $y = 2x + 3$  and  $y = 3 - \frac{1}{2}x^2$ .

3.5.  $y = 4x^2 - 3$  and  $y = 3 - 2x$ .

3.6.  $y = 4\sqrt{x}$  and  $y = \frac{1}{2}x^2$ .

3.7.  $y = 4 - (x - 4)^2$  and  $y = x - 2$ .

3.8.  $y = 5 - 3x^2$  and  $y = -3x - 1$ .

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[After attempting the questions above, please click this link to find the answers.](#)

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## Version history and licensing

v1.0: initial version created 05/25 by Donald Campbell as part of a University of St Andrews VIP project.

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