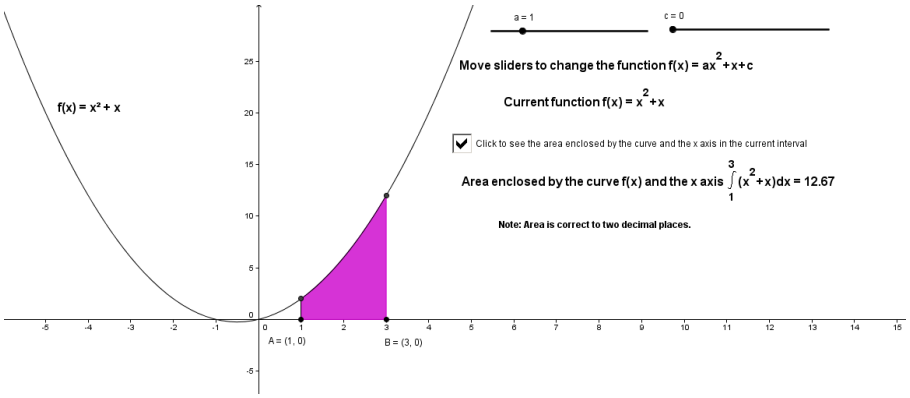
Student Activity: To investigate the relationship between integration of a function and the area enclosed by the curve representing the function and the x-axis or the y-axis

Use in connection with the interactive file, 'Integration and Area 2', on the Student's CD.



It is recommended that in all instances students draw a sketch of the function in question.

1. Calculate $\int_1^3 (x^2 + x)dx$. Check your results using the interactive file.

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2. What does the solution to $\int_1^3 (x^2 + x)dx$ represent?

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3.

   a. Move the sliders in the interactive file to show the graph of the function $f(x) = x^2 + x + 1$. Move the point A to (-3, 0) and the point B to (3, 0). What value is now given for the area enclosed by the curve of the function $f(x) = x^2 + x + 1$and the x-axis in the interval [-3, 3]?

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   b. Calculate the $\int_{-3}^3 (x^2 + x + 1)dx$.

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   c. Hence what is the area enclosed by the curve that represents the function $f(x) = x^2 + x + 1$ and the x-axis in the interval [-3, 3].

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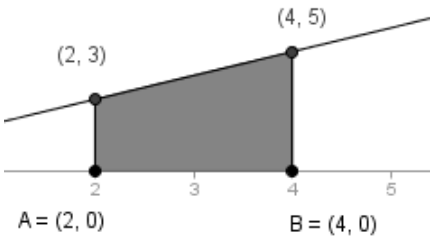
4.

a. Find the equation of the line between (2, 3) and (4, 5) and using integration, find the area of the shaded region in the diagram.



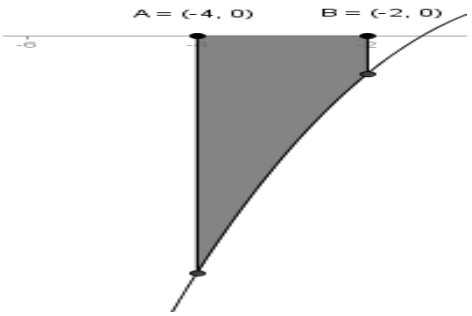
b. Verify your answer.

5. Given that the area enclosed by the x-axis and the curve that represents the function $f(x) = x^2 + x + 4$ in the interval $[0, b]$ is $12\frac{2}{3}$ and $b \in \mathbb{N}$, find b.

6. Find the area of the region bounded by the curve that represents $f(x) = 2x^2 + x + 1$ and the x-axis in the interval $[-4, 0]$.

7. Given that the curve represented in the diagram represents the function

f(x) = $-2x^2 + x + 5$, find the area of the shaded section. (Note: Area is always positive.)



8. Find the area enclosed by the lines x= 1, x = 4 and y = x^2.

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9. Find the area enclosed by the lines x= 0, x = 3 and y = $x^2 + 4$.

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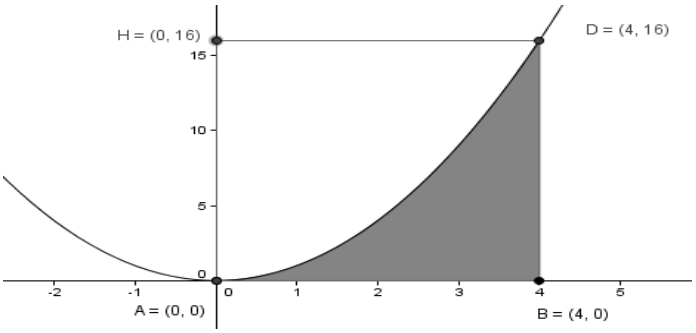
10. The curve in the diagram below represents the function f(x) = x^2. (Note: In the diagram the x and y axes are not in the ratio 1:1.)



a. Find the area enclosed by the curve that represents the function f(x) = x^2 and the x-axis in the interval x equals [0, 4].

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b. Find the area of the rectangle ABDH.

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c. Find the area enclosed by the curve that represents the function $f(x) = x^2$ and the y-axis in the interval [0, 16]?

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d. In the function represented in the diagram show that x=±root(y).

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e. Find the integral from 0 to 16 of root y (positive root).

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f. Why do we use the positive root only?

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g. What do you notice about the answers to part c. and part e.?

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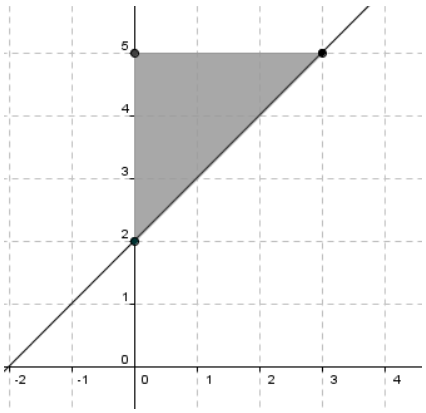
h.



Using the procedure used in parts d. to f., find the area enclosed by the curve that represents the function $f(x) = x + 2$ and the y-axis in the interval x equals 0 to 3.

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11. If the $\int_a^b f(x)dx$ is equal to the area enclosed by the curve of the function that represents f(x) and the x-axis, what does the $\int_{f(a)}^{f(b)} x\ dy$ represent?

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12. By integrating with respect to y, find the area enclosed by the curve $y = \sqrt{x-1}$ and the y-axis in the region x=1 to x=5.

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13. Complete the following: $\int_a^b y\ dx$ defines the area enclosed by the function f(x) = y and the ..... axis.

14. Complete the following: $\int_{f(a)}^{f(b)} x\ dy$ defines the area enclosed by the function f(x) = y and the ..... axis.