Math Sheet

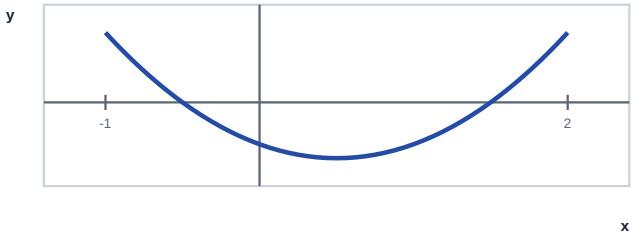
Name _____ Score _____ Teacher _____ Date _____

Area Under a Curve

Find total geometric area between the function and the x-axis. Split at every interior zero and add positive segment areas.

1. Find total geometric area on [-1, 2].

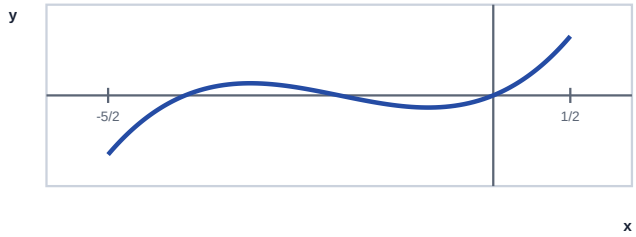
$f(x) = x^2 - x - \frac{3}{4}$



Shade, split at zeros, and add positive areas:

2. Find total geometric area on [-5/2, 1/2].

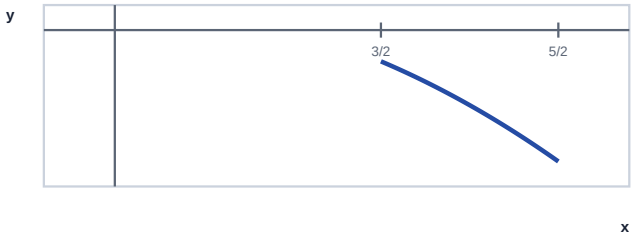
$f(x) = \frac{1}{2} \cdot x^3 + \frac{3}{2} \cdot x^2 + x$



Shade, split at zeros, and add positive areas:

3. Find total geometric area on [3/2, 5/2].

$f(x) = -\frac{1}{2} \cdot x^2 + \frac{1}{2}$



Shade, split at zeros, and add positive areas:

4. Find total geometric area on [7/2, 4].

$f(x) = -\frac{1}{2} \cdot x^3 + 3 \cdot x^2 - \frac{11}{2} \cdot x + 3$

Shade, split at zeros, and add positive areas:

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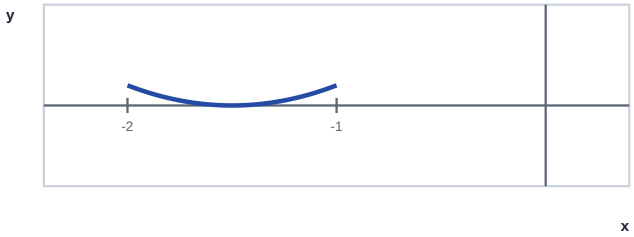
Area Under a Curve

Find total geometric area between the function and the x-axis. Split at every interior zero and add positive segment areas.

5. Find total geometric area on [-2, -1].

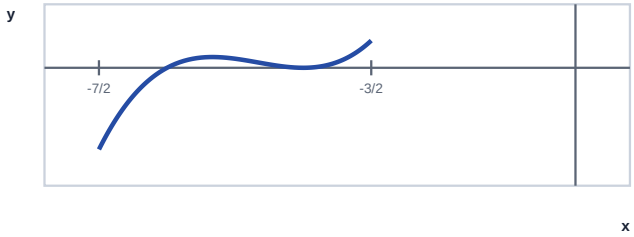
$f(x) = \frac{1}{2} \cdot x^2 + \frac{3}{2} \cdot x + \frac{9}{8}$



Shade, split at zeros, and add positive areas:

6. Find total geometric area on [-7/2, -3/2].

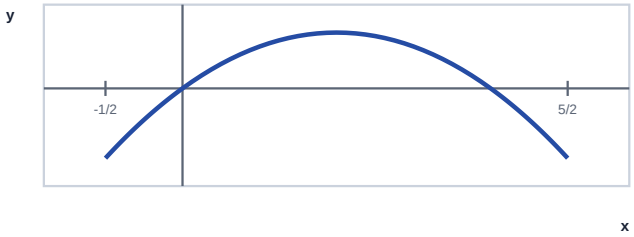
$f(x) = x^3 + 7 \cdot x^2 + 16 \cdot x + 12$



Shade, split at zeros, and add positive areas:

7. Find total geometric area on [-1/2, 5/2].

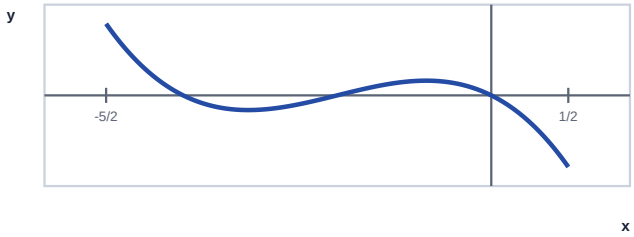
$f(x) = -x^2 + 2 \cdot x$



Shade, split at zeros, and add positive areas:

8. Find total geometric area on [-5/2, 1/2].

$f(x) = -x^3 - 3 \cdot x^2 - 2 \cdot x$



Shade, split at zeros, and add positive areas:

Math Sheet

Name _____ Score _____ Teacher _____ Date _____

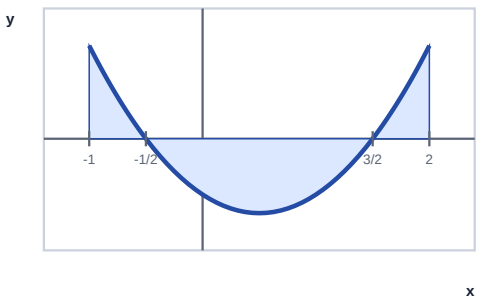
Area Under a Curve

Worked Answer Key

Find total geometric area between the function and the x-axis. Split at every interior zero and add positive segment areas.

1. Zeros/cuts: -1, -1/2, 3/2, 2

$f(x) = x^2 - x - \frac{3}{4}$



Primitive $F(x) = \frac{1}{3}\cdot x^3 - \frac{1}{2}\cdot x^2 - \frac{3}{4}\cdot x$

Segment 1: -1 to -1/2; f is positive.

$$\int_{-1}^{\frac{-1}{2}} x^2 - x - \frac{3}{4}\,dx$$

Endpoint subtraction: $\frac{5}{24} - \left(\frac{-1}{12}\right) = \frac{7}{24}$

Segment 2: -1/2 to 3/2; f is negative.

$$\int_{\frac{-1}{2}}^{\frac{3}{2}} -1 \cdot \left(x^2 - x - \frac{3}{4}\right)dx$$

Endpoint subtraction: $-1 \cdot \frac{-9}{8} - \left(-1 \cdot \frac{5}{24}\right) = \frac{4}{3}$

Segment 3: 3/2 to 2; f is positive.

$$\int_{\frac{3}{2}}^{2} x^2 - x - \frac{3}{4}\,dx$$

Endpoint subtraction: $\frac{-5}{6} - \left(\frac{-9}{8}\right) = \frac{7}{24}$

Total area = $\frac{7}{24} + \frac{4}{3} + \frac{7}{24}$

$= \frac{23}{12}$ **square units**

Name _____ Score _____ Teacher _____ Date _____

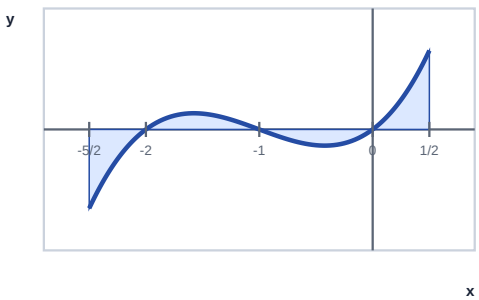
Area Under a Curve

Worked Answer Key

Find total geometric area between the function and the x-axis. Split at every interior zero and add positive segment areas.

2. Zeros/cuts: -5/2, -2, -1, 0, 1/2

$f(x) = \frac{1}{2}\cdot x^3 + \frac{3}{2}\cdot x^2 + x$



Primitive $F(x) = \frac{1}{8}\cdot x^4 + \frac{1}{2}\cdot x^3 + \frac{1}{2}\cdot x^2$

Segment 1: -5/2 to -2; f is negative.

$$\int_{\frac{-5}{2}}^{-2} -1 \cdot\left(\frac{1}{2}\cdot x^3 + \frac{3}{2}\cdot x^2 + x\right) dx$$

Endpoint subtraction: $-1 \cdot 0 - \left(-1 \cdot \frac{25}{128}\right) = \frac{25}{128}$

Segment 2: -2 to -1; f is positive.

$$\int_{-2}^{-1} \frac{1}{2}\cdot x^3 + \frac{3}{2}\cdot x^2 + x \, dx$$

Endpoint subtraction: $\frac{1}{8} - (0) = \frac{1}{8}$

Segment 3: -1 to 0; f is negative.

$$\int_{-1}^{0} -1 \cdot\left(\frac{1}{2}\cdot x^3 + \frac{3}{2}\cdot x^2 + x\right) dx$$

Endpoint subtraction: $-1 \cdot 0 - \left(-1 \cdot \frac{1}{8}\right) = \frac{1}{8}$

Segment 4: 0 to 1/2; f is positive.

$$\int_{0}^{\frac{1}{2}} \frac{1}{2}\cdot x^3 + \frac{3}{2}\cdot x^2 + x \, dx$$

Endpoint subtraction: $\frac{25}{128} - (0) = \frac{25}{128}$

Total area $= \frac{25}{128} + \frac{1}{8} + \frac{1}{8} + \frac{25}{128}$

$= \frac{41}{64}$ **square units**

Name _____ Score _____ Teacher _____ Date _____

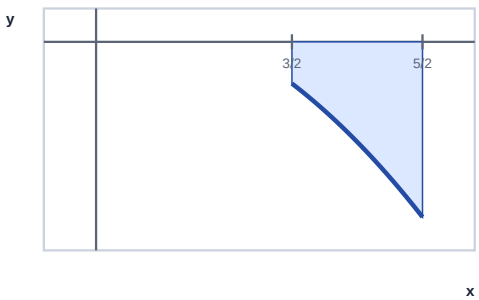
Area Under a Curve

Worked Answer Key

Find total geometric area between the function and the x-axis. Split at every interior zero and add positive segment areas.

3. Zeros/cuts: 3/2, 5/2

$f(x) = -\frac{1}{2}\cdot x^2 + \frac{1}{2}$



Primitive $F(x) = -\frac{1}{6}\cdot x^3 + \frac{1}{2}\cdot x$

Segment 1: 3/2 to 5/2; f is negative.

$$\int_{\frac{3}{2}}^{\frac{5}{2}} -1 \cdot \left(-\frac{1}{2}\cdot x^2 + \frac{1}{2}\right) dx$$

Endpoint subtraction: $-1 \cdot \frac{-65}{48} - \left(-1 \cdot \frac{3}{16}\right) = \frac{37}{24}$

Total area = $\frac{37}{24}$

$= \frac{37}{24}$ **square units**

Name _____ Score _____ Teacher _____ Date _____

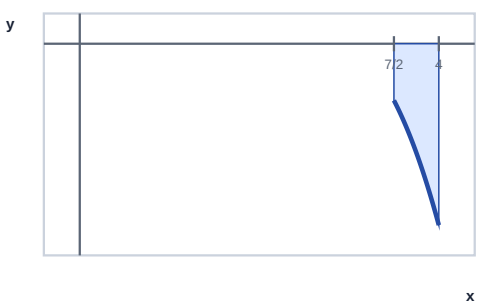
Area Under a Curve

Worked Answer Key

Find total geometric area between the function and the x-axis. Split at every interior zero and add positive segment areas.

4. Zeros/cuts: 7/2, 4

$f(x) = -\frac{1}{2}\cdot x^3 + 3\cdot x^2 - \frac{11}{2}\cdot x + 3$



Primitive $F(x) = -\frac{1}{8}\cdot x^4 + x^3 - \frac{11}{4}\cdot x^2 + 3\cdot x$

Segment 1: 7/2 to 4; f is negative.

$$\int_{\frac{7}{2}}^{4} -1 \cdot \left(-\frac{1}{2}\cdot x^3 + 3\cdot x^2 - \frac{11}{2}\cdot x + 3\right) dx$$

Endpoint subtraction: $-1 \cdot 0 - \left(-1 \cdot \frac{119}{128}\right) = \frac{119}{128}$

Total area = $\frac{119}{128}$

$= \frac{119}{128}$ **square units**

Name _____ Score _____ Teacher _____ Date _____

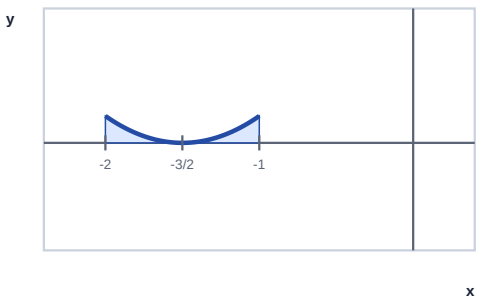
Area Under a Curve

Worked Answer Key

Find total geometric area between the function and the x-axis. Split at every interior zero and add positive segment areas.

5. Zeros/cuts: -2, -3/2, -1

$f(x) = \frac{1}{2}\cdot x^2 + \frac{3}{2}\cdot x + \frac{9}{8}$



Primitive $F(x) = \frac{1}{6}\cdot x^3 + \frac{3}{4}\cdot x^2 + \frac{9}{8}\cdot x$

Segment 1: -2 to -3/2; f is positive.

$$\int_{-2}^{\frac{-3}{2}} \frac{1}{2}\cdot x^2 + \frac{3}{2}\cdot x + \frac{9}{8}\,dx$$

Endpoint subtraction: $\frac{-9}{16} - \left(\frac{-7}{12}\right) = \frac{1}{48}$

Segment 2: -3/2 to -1; f is positive.

$$\int_{\frac{-3}{2}}^{-1} \frac{1}{2}\cdot x^2 + \frac{3}{2}\cdot x + \frac{9}{8}\,dx$$

Endpoint subtraction: $\frac{-13}{24} - \left(\frac{-9}{16}\right) = \frac{1}{48}$

Total area = $\frac{1}{48} + \frac{1}{48}$

$= \frac{1}{24}$ **square units**

Name _____ Score _____ Teacher _____ Date _____

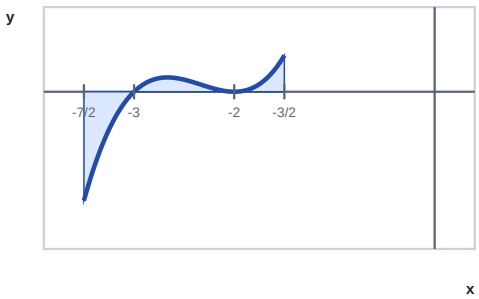
Area Under a Curve

Worked Answer Key

Find total geometric area between the function and the x-axis. Split at every interior zero and add positive segment areas.

6. Zeros/cuts: -7/2, -3, -2, -3/2

f(x) = $x^3 + 7 \cdot x^2 + 16 \cdot x + 12$



Primitive F(x) = $\frac{1}{4} \cdot x^4 + \frac{7}{3} \cdot x^3 + 8 \cdot x^2 + 12 \cdot x$

Segment 1: -7/2 to -3; f is negative.

$$\int_{\frac{-7}{2}}^{-3} -1 \cdot \left(x^3 + 7 \cdot x^2 + 16 \cdot x + 12\right) dx$$

Endpoint subtraction: $-1 \cdot \frac{-27}{4} - \left(-1 \cdot \frac{-1253}{192}\right) = \frac{43}{192}$

Segment 2: -3 to -2; f is positive.

$$\int_{-3}^{-2} x^3 + 7 \cdot x^2 + 16 \cdot x + 12 \, dx$$

Endpoint subtraction: $\frac{-20}{3} - \left(\frac{-27}{4}\right) = \frac{1}{12}$

Segment 3: -2 to -3/2; f is positive.

$$\int_{-2}^{\frac{-3}{2}} x^3 + 7 \cdot x^2 + 16 \cdot x + 12 \, dx$$

Endpoint subtraction: $\frac{-423}{64} - \left(\frac{-20}{3}\right) = \frac{11}{192}$

Total area = $\frac{43}{192} + \frac{1}{12} + \frac{11}{192}$

$= \frac{35}{96}$ **square units**

Name _____ Score _____ Teacher _____ Date _____

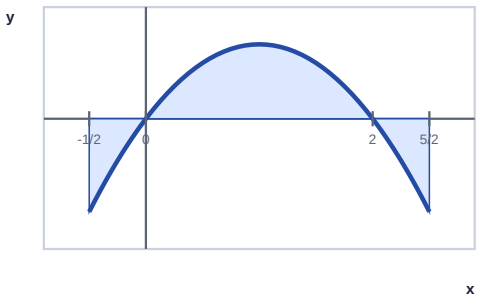
Area Under a Curve

Worked Answer Key

Find total geometric area between the function and the x-axis. Split at every interior zero and add positive segment areas.

7. Zeros/cuts: -1/2, 0, 2, 5/2

f(x) = $-x^2 + 2 \cdot x$



Primitive F(x) = $-\frac{1}{3} \cdot x^3 + x^2$

Segment 1: -1/2 to 0; f is negative.

$$\int_{\frac{-1}{2}}^{0} -1 \cdot \left(-x^2 + 2 \cdot x\right) dx$$

Endpoint subtraction: $-1 \cdot 0 - \left(-1 \cdot \frac{7}{24}\right) = \frac{7}{24}$

Segment 2: 0 to 2; f is positive.

$$\int_{0}^{2} -x^2 + 2 \cdot x \, dx$$

Endpoint subtraction: $\frac{4}{3} - \left(0\right) = \frac{4}{3}$

Segment 3: 2 to 5/2; f is negative.

$$\int_{2}^{\frac{5}{2}} -1 \cdot \left(-x^2 + 2 \cdot x\right) dx$$

Endpoint subtraction: $-1 \cdot \frac{25}{24} - \left(-1 \cdot \frac{4}{3}\right) = \frac{7}{24}$

Total area = $\frac{7}{24} + \frac{4}{3} + \frac{7}{24}$

$= \frac{23}{12}$ **square units**

Name _____ Score _____ Teacher _____ Date _____

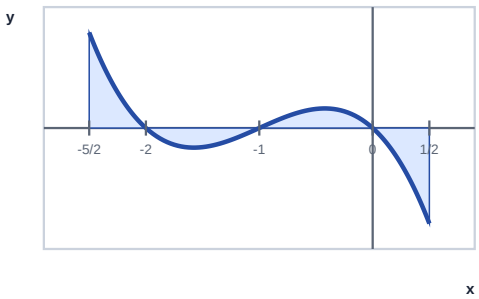
Area Under a Curve

Worked Answer Key

Find total geometric area between the function and the x-axis. Split at every interior zero and add positive segment areas.

8. Zeros/cuts: -5/2, -2, -1, 0, 1/2

$f(x) = -x^3 - 3\cdot x^2 - 2\cdot x$



Primitive $F(x) = -\frac{1}{4}\cdot x^4 - x^3 - x^2$

Segment 1: -5/2 to -2; f is positive.

$$\int_{\frac{-5}{2}}^{-2} -x^3 - 3\cdot x^2 - 2\cdot x\,dx$$

Endpoint subtraction: $0 - \left(\frac{-25}{64}\right) = \frac{25}{64}$

Segment 2: -2 to -1; f is negative.

$$\int_{-2}^{-1} -1\cdot\left(-x^3 - 3\cdot x^2 - 2\cdot x\right)dx$$

Endpoint subtraction: $-1\cdot\frac{-1}{4} - \left(-1\cdot 0\right) = \frac{1}{4}$

Segment 3: -1 to 0; f is positive.

$$\int_{-1}^{0} -x^3 - 3\cdot x^2 - 2\cdot x\,dx$$

Endpoint subtraction: $0 - \left(\frac{-1}{4}\right) = \frac{1}{4}$

Segment 4: 0 to 1/2; f is negative.

$$\int_{0}^{\frac{1}{2}} -1\cdot\left(-x^3 - 3\cdot x^2 - 2\cdot x\right)dx$$

Endpoint subtraction: $-1\cdot\frac{-25}{64} - \left(-1\cdot 0\right) = \frac{25}{64}$

Total area = $\frac{25}{64} + \frac{1}{4} + \frac{1}{4} + \frac{25}{64}$

$= \frac{41}{32}$ **square units**