

Arc Length and Surface Area

Write the correct x- or y-direction integral. Evaluate only the selected friendly exact families; otherwise the exact setup is the final answer.

1. The quarter circle $y=\sqrt{196-x^2}$, $0\leq x\leq 14$, is revolved about the x-axis. Set up the surface-area integral.

2. For $y=\frac{2}{3}(x+1)^{3/2}$, $0\leq x\leq 5$, find the exact arc length.

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3. For $x=2/3(y+1)^{3/2}$, $0\leq y\leq 9$, set up the arc-length integral.

4. The quarter circle $x=\sqrt{196-y^2}$, $0\leq y\leq 14$, is revolved about the y-axis. Find the exact surface area.

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Write the correct x- or y-direction integral. Evaluate only the selected friendly exact families; otherwise the exact setup is the final answer.

5. The quarter circle $y=\sqrt{36-x^2}$, $0\leq x\leq 6$, is revolved about the x-axis. Set up the surface-area integral.

6. For $x=2/3(y+1)^{3/2}$, $0\leq y\leq 9$, find the exact arc length.

Math Sheet

Name _____ Score _____ Teacher _____ Date _____

Arc Length and Surface Area

Worked Answer Key

Write the correct x- or y-direction integral. Evaluate only the selected friendly exact families; otherwise the exact setup is the final answer.

1. The quarter circle $y=\sqrt{196-x^2}$, $0\leq x\leq 14$, is revolved about the x-axis. Set up the surface-area integral.

Answer: $2\pi \int_0^{14} y \sqrt{1+(dy/dx)^2} dx$.

1. Radius y is nonnegative on $[0,14]$.
2. $2\pi \int_0^{14} y \sqrt{1+(dy/dx)^2} dx$; the product simplifies to the constant 14.
3. The exact setup is the requested result.

2. For $y=2/3(x+1)^{3/2}$, $0\leq x\leq 5$, find the exact arc length.

Answer: $2/3[(7)^{3/2}-2\sqrt{2}]$ units.

1. $dy/dx=\sqrt{x+1}$.
2. $L=\int_0^5 \sqrt{1+(dy/dx)^2}dx=\int_0^5 \sqrt{x+2} dx$.
3. $L=2/3[(7)^{3/2}-2\sqrt{2}]$.

Math Sheet

Name _____ Score _____ Teacher _____ Date _____

Arc Length and Surface Area

Worked Answer Key

Write the correct x- or y-direction integral. Evaluate only the selected friendly exact families; otherwise the exact setup is the final answer.

3. For $x = \frac{2}{3}(y+1)^{3/2}$, $0 \leq y \leq 9$, set up the arc-length integral.

Answer: integral from 0 to 9 $\sqrt{y+2}$ dy.

1. $dx/dy = \sqrt{y+1}$.
2. $L = \int_0^9 \sqrt{1 + (dx/dy)^2} dy = \int_0^9 \sqrt{y+2} dy$.
3. The exact setup is the requested final result.

4. The quarter circle $x = \sqrt{196 - y^2}$, $0 \leq y \leq 14$, is revolved about the y-axis. Find the exact surface area.

Answer: 392π square units.

1. Radius x is nonnegative on $[0, 14]$.
2. $2\pi \int_0^{14} x \sqrt{1 + (dx/dy)^2} dy$; the product simplifies to the constant 14.
3. $2\pi \int_0^{14} 14 dy = 392\pi$.

Arc Length and Surface Area

Worked Answer Key

Write the correct x- or y-direction integral. Evaluate only the selected friendly exact families; otherwise the exact setup is the final answer.

5. The quarter circle $y = \sqrt{36 - x^2}$, $0 \leq x \leq 6$, is revolved about the x-axis. Set up the surface-area integral.

Answer: $2\pi \int_0^6 y \sqrt{1 + (dy/dx)^2} dx$.

1. Radius y is nonnegative on $[0, 6]$.
2. $2\pi \int_0^6 y \sqrt{1 + (dy/dx)^2} dx$; the product simplifies to the constant 6.
3. The exact setup is the requested result.

6. For $x = \frac{2}{3}(y+1)^{3/2}$, $0 \leq y \leq 9$, find the exact arc length.

Answer: $\frac{2}{3}[(11)^{3/2} - 2\sqrt{2}]$ units.

1. $dx/dy = \sqrt{y+1}$.
2. $L = \int_0^9 \sqrt{1 + (dx/dy)^2} dy = \int_0^9 \sqrt{y+2} dy$.
3. $L = \frac{2}{3}[(11)^{3/2} - 2\sqrt{2}]$.