Name _____ Score _____ Teacher _____ Date _____

Polar Calculus

Use one complete closed-curve trace or the stated fixed spiral interval. Show x(theta), y(theta), and their derivatives for slopes; write area and arc-length integrals with correct bounds.

1. **For r = 8 cos(3theta), find or set up arc length for one petal. Use -pi/6 <= theta <= pi/6 for one petal.**

numbered radial scale

2. **For r = 9(1 + cos(theta)), find dy/dx at theta = pi/2 and classify the tangent. Use exact values.**

Name _____ Score _____ Teacher _____ Date _____

Polar Calculus

Use one complete closed-curve trace or the stated fixed spiral interval. Show x(theta), y(theta), and their derivatives for slopes; write area and arc-length integrals with correct bounds.

3. **For r = 10 cos(theta), find the area swept by one complete trace. Use 0 <= theta <= pi.**

numbered radial scale

4. **For r = 1 + 11 cos(theta), find or set up arc length over the requested nonrepeating trace. Use 0 <= theta <= 2pi.**

numbered radial scale

Use exact values unless numeric answer form is selected.

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Polar Calculus

Use one complete closed-curve trace or the stated fixed spiral interval. Show x(theta), y(theta), and their derivatives for slopes; write area and arc-length integrals with correct bounds.

5. **For r = 12theta, find dy/dx at theta = pi/2 and classify the tangent. Use exact values.**

6. **For r = 2(1 + cos(theta)), find the area swept by one complete trace. Use 0 <= theta <= 2pi.**

numbered radial scale

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Polar Calculus

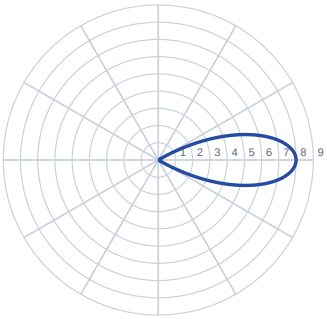
Worked Answer Key

Use one complete closed-curve trace or the stated fixed spiral interval. Show x(theta), y(theta), and their derivatives for slopes; write area and arc-length integrals with correct bounds.

1. **For r = 8 cos(3theta), find or set up arc length for one petal. Use -pi/6 <= theta <= pi/6 for one petal.**

Answer: integral from -pi/6 to pi/6 of 8sqrt(cos^2(3theta) + 9sin^2(3theta)) dtheta.

1. Use L = integral sqrt(r(theta)^2 + (dr/dtheta)^2) dtheta over -pi/6 <= theta <= pi/6 for one petal.
2. Use bounds that do not retrace the curve.



numbered radial scale

2. **For r = 9(1 + cos(theta)), find dy/dx at theta = pi/2 and classify the tangent. Use exact values.**

Answer: dy/dx = 1, so the tangent is neither horizontal nor vertical.

1. Use dx/dtheta = r'cos(theta) - r sin(theta) and dy/dtheta = r'sin(theta) + r cos(theta).
2. At the stated angle, dx/dtheta = -9 and dy/dtheta = -9.
3. A horizontal tangent requires dy/dtheta = 0 with dx/dtheta nonzero; a vertical tangent requires dx/dtheta = 0 with dy/dtheta nonzero.

Name _____ Score _____ Teacher _____ Date _____

Polar Calculus

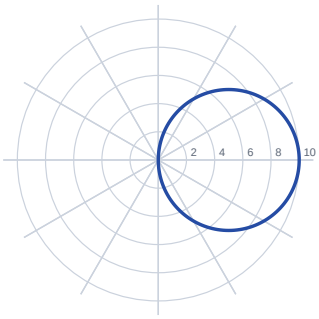
Worked Answer Key

Use one complete closed-curve trace or the stated fixed spiral interval. Show x(theta), y(theta), and their derivatives for slopes; write area and arc-length integrals with correct bounds.

3. **For r = 10 cos(theta), find the area swept by one complete trace. Use 0 <= theta <= pi.**

Answer: 100pi/4.

1. Use A = (1/2) integral r(theta)^2 dtheta with bounds 0 <= theta <= pi.
2. The chosen bounds cover the requested region once, so no repeated-trace factor is introduced.

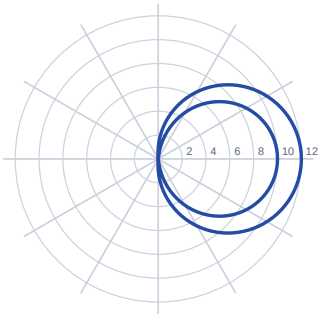


numbered radial scale

4. **For r = 1 + 11 cos(theta), find or set up arc length over the requested nonrepeating trace. Use 0 <= theta <= 2pi.**

Answer: integral from 0 to 2pi of sqrt(122 + 22cos(theta)) dtheta.

1. Use L = integral sqrt(r(theta)^2 + (dr/dtheta)^2) dtheta over 0 <= theta <= 2pi.
2. Keep the square root nonnegative even where r is negative; arc length does not use signed radius as signed distance.



numbered radial scale

Name _____ Score _____ Teacher _____ Date _____

Polar Calculus

Worked Answer Key

Use one complete closed-curve trace or the stated fixed spiral interval. Show x(theta), y(theta), and their derivatives for slopes; write area and arc-length integrals with correct bounds.

5. **For r = 12theta, find dy/dx at theta = pi/2 and classify the tangent. Use exact values.**

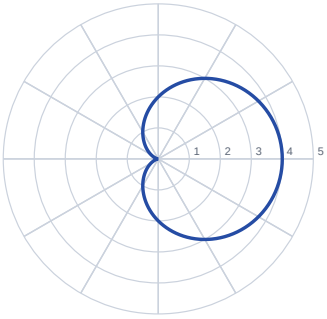
Answer: dy/dx = -2/pi, so the tangent is neither horizontal nor vertical.

1. Use dx/dtheta = r'cos(theta) - r sin(theta) and dy/dtheta = r'sin(theta) + r cos(theta).
2. At the stated angle, dx/dtheta = -12pi/2 and dy/dtheta = 12.
3. A horizontal tangent requires dy/dtheta = 0 with dx/dtheta nonzero; a vertical tangent requires dx/dtheta = 0 with dy/dtheta nonzero.

6. **For r = 2(1 + cos(theta)), find the area swept by one complete trace. Use 0 <= theta <= 2pi.**

Answer: 12pi/2.

1. Use A = (1/2) integral r(theta)^2 dtheta with bounds 0 <= theta <= 2pi.
2. The chosen bounds cover the requested region once, so no repeated-trace factor is introduced.



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