Calculus 2 Workbook

Calculus with polar curves

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TANGENT LINE TO THE POLAR CURVE

1. Find the tangent line to the polar curve at $\theta = 2\pi/3$.

$$r = 3\cos\theta$$

2. Find the tangent line to the polar curve at $\theta = \pi/3$.

$$r = 5\sin\theta$$

3. Find the tangent line to the polar curve at $\theta = \pi/4$.

$$r = 4 - 2\cos\theta$$

4. Find the tangent line to the polar curve at $\theta = \pi$.

$$r = 8 - 5\sin\theta$$

5. Find the tangent line to the polar curve at $\theta = \pi/2$.

$$r = 7 - 6\cos\theta$$

VERTICAL AND HORIZONTAL TANGENT LINES TO THE POLAR CURVE

1. At which points does the polar curve have horizontal tangent lines?

$$r = 4 - 4\sin\theta$$

2. At which points does the polar curve have vertical tangent lines?

$$r = 6 - 6\cos\theta$$

3. At which points does the polar curve have horizontal tangent lines?

$$r = 8 - 2\sin\theta$$

INTERSECTION OF THE POLAR CURVES

1. Find the rectangular points of intersection of the polar curves.

$$r = 3\cos\theta$$

$$r = 3\sin\theta$$

2. Find the polar points of intersection of the polar curves.

$$r = 4$$

$$r = -8\sin\theta$$

3. Find the rectangular points of intersection of the polar curves.

$$r = 6 - 4\cos\theta$$

$$r = 5\cos\theta$$

AREA INSIDE A POLAR CURVE

■ 1. Find the area bounded by the polar curve over the interval.

$$r = 2 + 2\cos\theta$$

$$0 \leq \theta \leq 2\pi$$

■ 2. Find the area bounded by the polar curve over the interval.

$$r = 2\sin 2\theta$$

$$0 \leq \theta \leq 2\pi$$

■ 3. Find the area bounded by the polar curve over the interval.

$$r = 4 + 2\sin\theta$$

$$0 \leq \theta \leq 2\pi$$

■ 4. Find the area bounded by the polar curve over the interval.

$$r^2 = \sin\theta$$

$$0 \leq \theta \leq \pi$$

5. Find the area bounded by the polar curve over the interval.

$$r = 2\cos\theta$$

$$-\frac{\pi}{4} \leq \theta \leq \frac{\pi}{4}$$

AREA BOUNDED BY ONE LOOP OF A POLAR CURVE

1. Find the area of one loop of the polar curve.

$$r = 6\cos(4\theta)$$

2. Find the area of one loop of the polar curve.

$$r = 4\sin(5\theta)$$

3. Find the area of one loop of the polar curve.

$$r = 7\sin(6\theta)$$

4. Find the area of one loop of the polar curve.

$$r = 5\sin(3\theta)$$

AREA BETWEEN POLAR CURVES

1. Find the area of the region that inside both polar curves.

$$r = 4\cos\theta$$

$$r = 2$$

2. Find the area of the region inside $r = 1 - \cos\theta$ but outside $r = 1$.

3. Find the area of the region inside $r = 1 + \cos\theta$ but outside the circle $r = \cos\theta$.

4. Find the area of the region inside $r = 2 + \cos\theta$ but outside the circle $r = 5\cos\theta$.

AREA INSIDE BOTH POLAR CURVES

1. Find the area of the region that's inside both polar curves.

$$r = 2\cos\theta$$

$$r = 2\sin\theta$$

2. Find the area of the region that's inside both polar curves.

$$r = 2\sin\theta$$

$$r = 1$$

3. Find the area of the region that's inside both polar curves.

$$r = 2(1 - \cos\theta)$$

$$r = 2$$

4. Find the area of the region that's inside both polar curves.

$$r = 2(1 + \cos\theta)$$

$$r = 2(1 - \cos\theta)$$

5. Find the area of the region that's inside both polar curves.

$$r = 3 + 2\sin\theta$$

$$r = 2$$

SURFACE AREA OF REVOLUTION OF A POLAR CURVE

■ 1. Find the surface area generated by revolving the polar curve about the y-axis over the interval $0 \leq \theta \leq \pi$.

$$r = 2\cos\theta$$

■ 2. Find the surface area generated by revolving the polar curve about the x-axis over the interval $0 \leq \theta \leq \pi/2$.

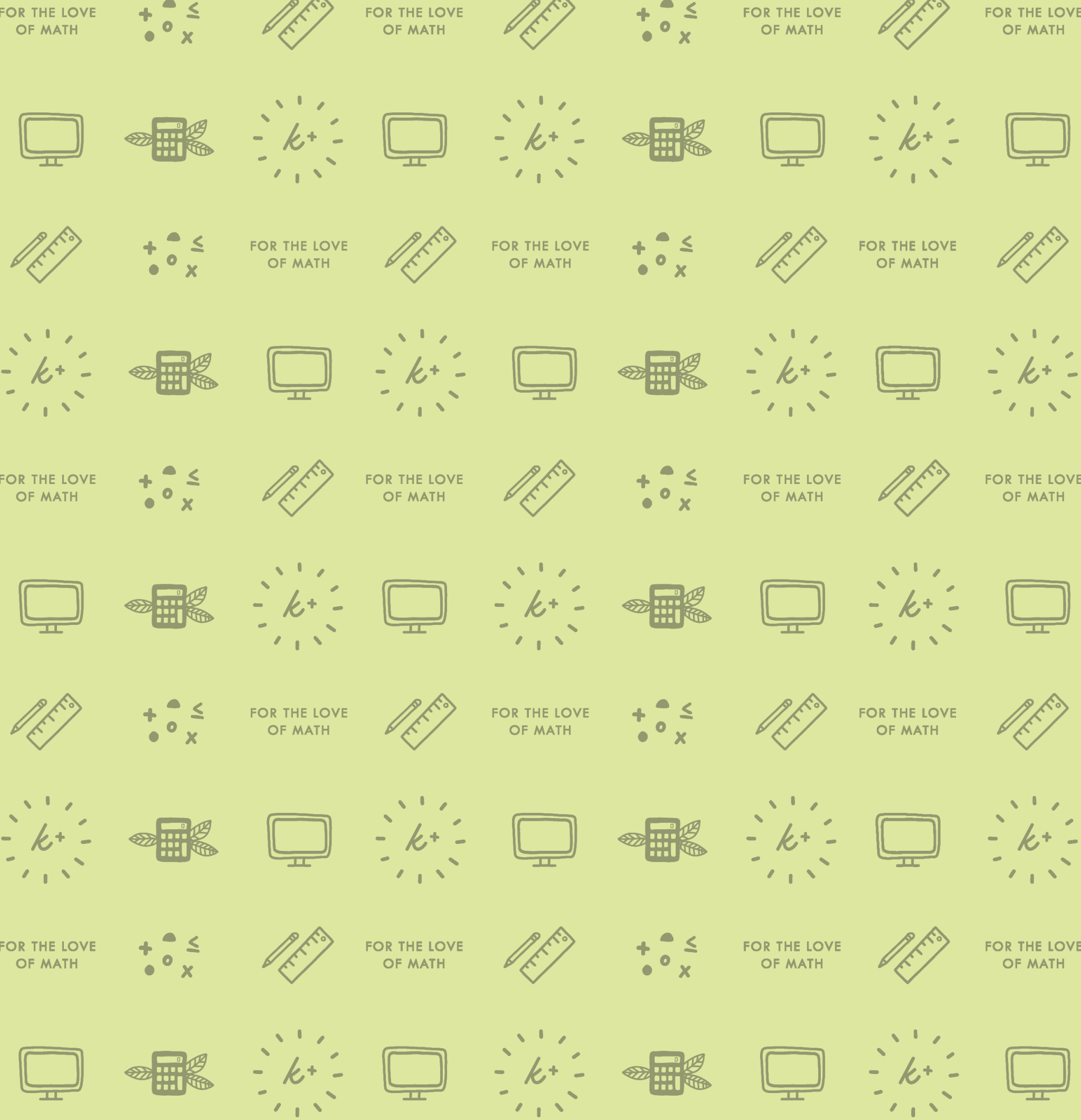
$$r = 4\cos\theta$$

■ 3. Find the surface area generated by revolving the polar curve about the y-axis over the interval $0 \leq \theta \leq \pi/2$.

$$r = 8\sin\theta$$

■ 4. Find the surface area generated by revolving the polar curve about the x-axis over the interval $0 \leq \theta \leq \pi$.

$$r = 7\sin\theta$$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