Calculus 2 Workbook

Calculus with parametric curves

krista king MATH

TANGENT LINES OF PARAMETRIC CURVES

1. Find the equation of the tangent line to the parametric curve at $t = 3$.

$$x = 3t + 5$$

$$y = 7t - 2$$

2. Find the equation of the tangent line to the parametric curve at $t = 4$.

$$x = 3t^2 - 12$$

$$y = 2t^3 + 6$$

3. Find the equation of the tangent line to the parametric curve at $t = \pi/3$.

$$x = \cos^2 t$$

$$y = \sin^2 t$$

4. Find the equation of the tangent line to the parametric curve at $t = 4$.

$$x = t^2 + t + 3$$

$$y = t^2 - 3t + 2$$

5. Find the equation of the tangent line to the parametric curve at $t = 9$.

$$x = 3\sqrt{t}$$

$$y = 5t\sqrt{t}$$

AREA UNDER A PARAMETRIC CURVE

1. Find the area under the parametric curve.

$$x(t) = 3t^2$$

$$y(t) = t + 2$$

$$0 \leq t \leq 3$$

2. Find the area under the parametric curve.

$$x(t) = 5t^2 - 3t + 4$$

$$y(t) = 6t - 1$$

$$0 \leq t \leq 5$$

3. Find the area under the parametric curve.

$$x(t) = t + \sin t$$

$$y(t) = 4 + \cos t$$

$$0 \leq t \leq 2\pi$$

4. Find the area under the parametric curve.

$$x(t) = t^2 + 5t - 8$$

$$y(t) = t^2 + 4t + 2$$

$$0 \leq t \leq 2$$

AREA UNDER ONE ARC OR LOOP

1. Find the area in one loop of the parametric curve.

$$x(\theta) = 2\cos(2\theta)$$

$$y(\theta) = 4 + \sin(2\theta)$$

$$0 \le \theta \le \pi$$

2. Find the area in one loop of the parametric curve.

$$x(\theta) = 2\sin\theta$$

$$y(\theta) = 5 + \cos\theta$$

$$0 \le \theta \le 2\pi$$

3. Find the area in one loop of the parametric curve.

$$x(\theta) = 8 + 3\cos\theta$$

$$y(\theta) = 9 - 2\sin\theta$$

$$0 \le \theta \le 2\pi$$

4. Find the area in one loop of the parametric curve.

$$x(\theta) = 12 + 6\sin\theta$$

$$y(\theta) = 12 - 6\cos\theta$$

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

5. Find the area in one loop of the parametric curve.

$$x(\theta) = 15 - 5\cos\theta$$

$$y(\theta) = 5 + 15\sin\theta$$

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

ARC LENGTH OF PARAMETRIC CURVES

1. Find the length of the parametric curve on the given interval.

$$x(t) = 7 - 3t$$

$$y(t) = 5 + 8t$$

$$-1 \leq t \leq 4$$

2. Find the length of the parametric curve on the given interval.

$$x(t) = \cos^3 t$$

$$y(t) = \sin^3 t$$

$$0 \leq t \leq \frac{3\pi}{4}$$

3. Find the length of the parametric curve on the given interval.

$$x(t) = 5t - 5\sin t$$

$$y(t) = -5\cos t$$

$$0 \leq t \leq 2\pi$$

4. Find the length of the parametric curve on the given interval.

$$x(t) = \cos t$$

$$y(t) = t + \sin t$$

$$0 \leq t \leq \pi$$

SURFACE AREA OF REVOLUTION, HORIZONTAL AXIS

■ 1. Find the surface area of revolution of the parametric curve on the interval $0 \leq t \leq 3$, rotated about the x-axis.

$$x = \frac{5}{3}t$$

$$y = 4t + 6$$

■ 2. Find the surface area of revolution of the parametric curve on the interval $0 \leq t \leq 2\pi$, rotated about the x-axis.

$$x = 3 + \cos t$$

$$y = 4 + \sin t$$

■ 3. Find the surface area of revolution of the parametric curve on the interval $0 \leq t \leq 2\pi$, rotated about the x-axis.

$$x = 7 - 3\sin t$$

$$y = 6 + 3\cos t$$

■ 4. Find the surface area of revolution of the parametric curve on the interval $0 \leq t \leq \pi$, rotated about the x-axis.

$$x = 5 - \cos(2t)$$

$$y = 3 + \sin(2t)$$

SURFACE AREA OF REVOLUTION, VERTICAL AXIS

■ 1. Find the surface area of revolution of the parametric curve on the interval $0 \leq t \leq \pi/3$, rotated about the y-axis.

$$x = 8 + \sin(6t)$$

$$y = 7 - \cos(6t)$$

■ 2. Find the surface area of revolution of the parametric curve on the interval $0 \leq t \leq 2\pi$, rotated about the y-axis.

$$x = 5 + 4\sin(t)$$

$$y = 5 + 4\cos(t)$$

■ 3. Find the surface area of revolution of the parametric curve on the interval $0 \leq t \leq 2\pi$, rotated about the y-axis.

$$x = 12 - \sin t$$

$$y = 2 + \cos t$$

■ 4. Find the surface area of revolution of the parametric curve on the interval $0 \leq t \leq \pi$, rotated about the y-axis.

$$x = 4 - 3\sin(2t)$$

$$y = 4 - 3\cos(2t)$$

5. Find the surface area of revolution of the parametric curve on the interval $0 \leq t \leq 4$, rotated about the y-axis.

$$x = 6t + 5$$

$$y = 8t + 7$$

VOLUME OF REVOLUTION, PARAMETRIC CURVES

■ 1. Find the volume of revolution of the parametric curve, rotated about the x-axis, over the interval $1 \leq t \leq 2$.

$$x(t) = 2t^2$$

$$y(t) = 4t^2$$

■ 2. Find the volume of revolution of the parametric curve, rotated about the y-axis, over the interval $1 \leq t \leq 3$.

$$x(t) = 3t$$

$$y(t) = 4t^2$$

■ 3. Find the volume of revolution of the parametric curve, rotated about the x-axis, over the interval $1 \leq t \leq 3$.

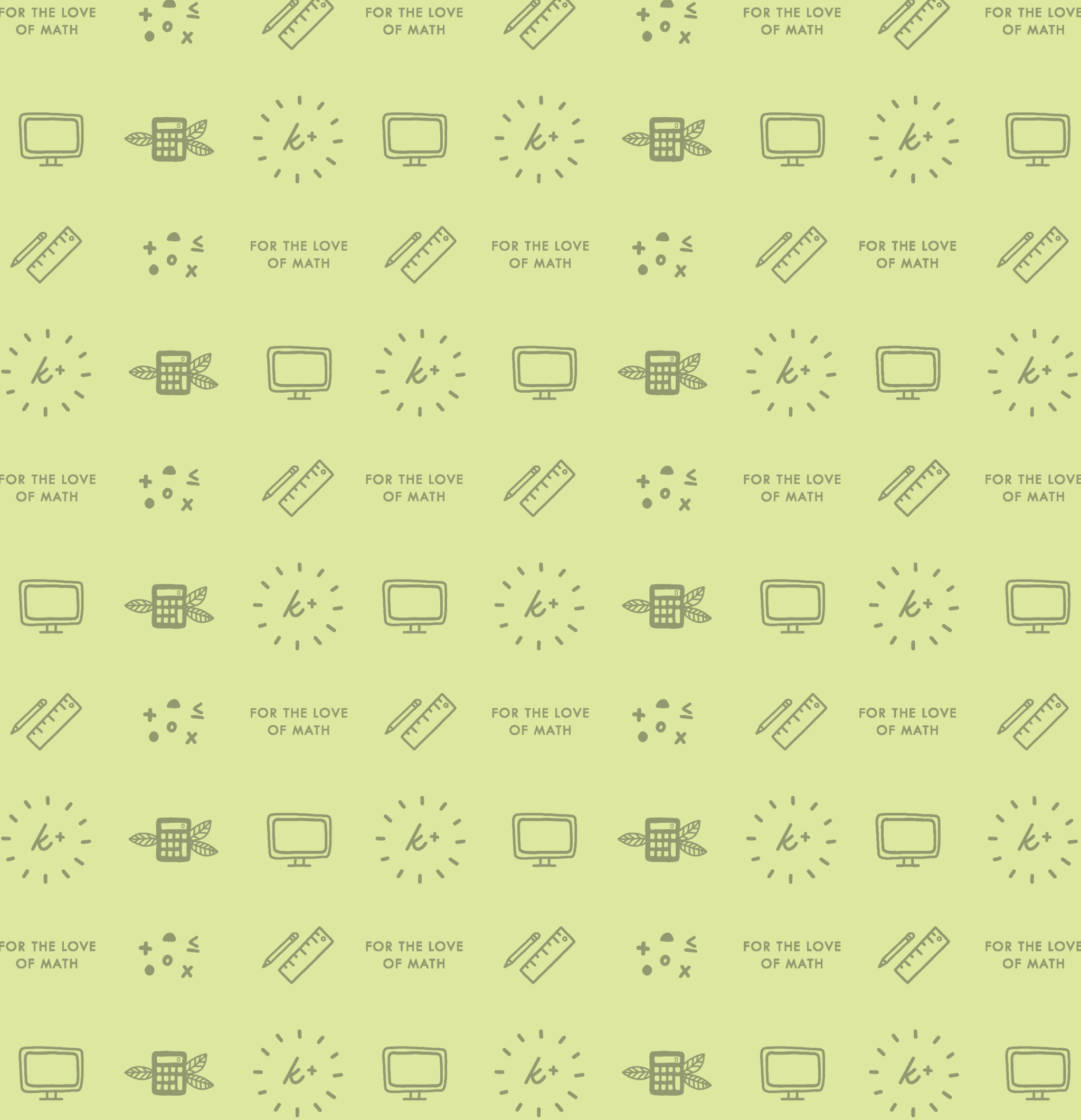
$$x(t) = 2e^{2t} - 4t$$

$$y(t) = 6e^{\frac{5t}{2}}$$

■ 4. Find the volume of revolution of the parametric curve, rotated about the y-axis, over the interval $0 \leq t \leq 1$.

$$x(t) = 3e^t$$

$$y(t) = e^t$$


FOR THE LOVE OF MATH