

# Math Sheet

Name \_\_\_\_\_ Score \_\_\_\_\_ Teacher \_\_\_\_\_ Date \_\_\_\_\_

## Parametric Calculus

Show derivatives with respect to  $t$  before forming  $dy/dx$ . Check  $dx/dt$  and  $dy/dt$  when classifying tangents, and preserve every stated traversal interval.

1. For  $x = 4 \cos(t)$ ,  $y = 4 \sin(t)$ , find  $d^2y/dx^2$  where  $\sin(t) \neq 0$ .

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2. For  $x = 3t + 2$ ,  $y = t^2 + 3t$ , find  $dy/dx$  and the tangent line at  $t = 3$ .

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Parametric Calculus

Show derivatives with respect to t before forming dy/dx. Check dx/dt and dy/dt when classifying tangents, and preserve every stated traversal interval.

3. For the parametric curve shown by  $x = 6 \cos(t)$ ,  $y = 6 \sin(t)$ ,  $0 \leq t \leq 2\pi$ , make a value table and sketch the traced curve with arrows for increasing t.

|       |   |       |        |
|-------|---|-------|--------|
| t     | 0 | $\pi$ | $2\pi$ |
| (x,y) |   |       |        |



4. Find horizontal and vertical tangents for  $x = t^2 + 0$ ,  $y = t^3 - 108t$ . Verify the companion derivative is nonzero.

# Math Sheet

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## Parametric Calculus

Show derivatives with respect to  $t$  before forming  $dy/dx$ . Check  $dx/dt$  and  $dy/dt$  when classifying tangents, and preserve every stated traversal interval.

5. The arc  $x = t$ ,  $y = 21(1 - t^2)$ ,  $-1 \leq t \leq 1$ , is traversed left to right and closed by the  $x$ -axis. Find the enclosed area with correct bounds and orientation.

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6. For  $x = 9 \cos(t)$ ,  $y = -9 \sin(t)$ , find speed and arc length on  $0 \leq t \leq 4\pi/2$ .

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