

Students are expected to complete homework assignments on their own before referring to the following pages. The answers and hints are designed to check work and clarify problems. The original intent of the layout was for display in class after assignments had been completed. Students should use the following information as help to understand the exercises and master the concepts.

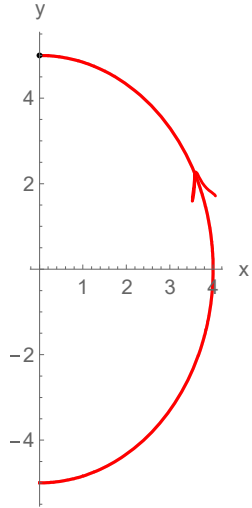
## Calculus C

### Chapter 10

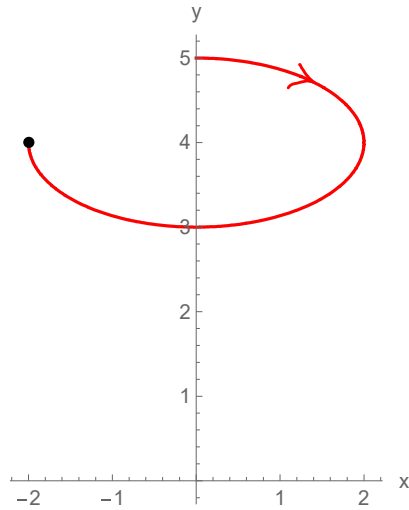
Even Answers & Hints  
for Homework

# 10.1 Even Answers

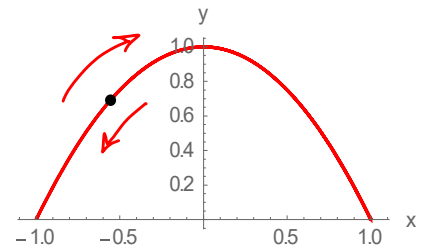
12



20



22



24 a) III b) I c) IV d) II

28 a) V b) I c) II d) VI e) IV f) III

## 10.2 Answers with Setups

$$(37) \int_1^2 \sqrt{1+4t^2} dt$$

$$(38) \int_{-3}^3 \sqrt{e^{2t}+4t^2} dt$$

$$(39) \int_0^{2\pi} \sqrt{3-2\sin t-2\cos t} dt$$

$$(40) \int_1^5 \sqrt{\frac{1}{t^2} + \frac{1}{4(t+1)}} dt = \int_1^5 \frac{t+2}{2t\sqrt{t+1}} dt$$

$$(41) \int_0^1 6t\sqrt{1+t^2} dt = 2(2\sqrt{2}-1)$$

$$(43) \int_0^2 \sqrt{\frac{1}{(1+t)^4} + \frac{1}{(1+t)^2}} dt = \int_0^2 \frac{\sqrt{t^2+2t+2}}{(1+t)^2} dt$$

$$(57) S = 2\pi \int_0^1 (t^2+1) e^t \sqrt{e^{2t}(t+1)^2(t^2+2t+2)} dt$$

$\uparrow (te^t+e^t)^2 + (t^2+1)e^t + e^t(2t))^2$

$$(58) S = \int_0^{\pi/3} 2\pi \sin 3t \sqrt{\sin^2 2t + 9\cos^2 3t} dt$$

$$(59) S = \int_0^1 2\pi t^2 \sqrt{9t^4+4t^2} dt$$

$$(60) S = \int_0^1 2\pi \cdot 3t^2 \sqrt{(3-3t^2)^2 + (6t)^2}$$

$$(65) S = \int_0^5 2\pi (3t^2) 6t \sqrt{1+t^2} dt$$

$\uparrow$  From  $\sqrt{(6t)^2 + (6t)^2}$

$$(66) S = \int_0^1 2\pi (e^t-t) \sqrt{(e^t-1)^2 + (2e^{t/2})^2} dt$$

$\hookrightarrow$  simplifies to  $(e^t+1)^2$

## Parametric Worksheet Answers

①  $x = t^2 - 10, y = 10 - t^2$

$$\frac{dx}{dt} = 2t, \quad \frac{dy}{dt} = -2t \quad \frac{dy}{dx} = \frac{dy/dt}{dx/dt} = \frac{-2t}{2t} = \underline{\underline{-1}}$$

$$\frac{d^2y}{dx^2} = \frac{\frac{d}{dt} \left[ \frac{dy}{dx} \right]}{dx/dt} = \frac{\frac{d}{dt} [-1]}{2t} = \frac{0}{2t} = \underline{\underline{0}}$$

What does each mean in terms of the graph?  
Write out your conclusions.

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②  $x = t \cos t, y = t \sin t$

$$\frac{dx}{dt} = \cos t - t \sin t, \quad \frac{dy}{dt} = \sin t + t \cos t$$

$$\frac{dy}{dx} = \frac{dy/dt}{dx/dt} = \frac{\sin t + t \cos t}{\cos t - t \sin t}$$

$$\left. \frac{dx}{dt} \right|_{t=\frac{7\pi}{3}} = \frac{1}{2} - \frac{7\pi}{3} \left( \frac{\sqrt{3}}{2} \right) \approx -5.8483$$

$$\left. \frac{dy}{dt} \right|_{t=\frac{7\pi}{3}} = \frac{\sqrt{3}}{2} + \frac{7\pi}{3} \left( \frac{1}{2} \right) \approx 4.53122$$

$$\left. \frac{dy}{dx} \right|_{t=\frac{7\pi}{3}} = \frac{\frac{\sqrt{3}}{2} + \frac{7\pi}{6}}{\frac{1}{2} - \frac{7\pi\sqrt{3}}{6}} = \frac{3\sqrt{3} + 7\pi}{3 - 7\sqrt{3}\pi} \approx -0.7748$$



What does each mean in terms of the graph?  
Write out your conclusions.

What do you know about  $\frac{d^2y}{dx^2}$  at  $t = \frac{7\pi}{3}$ ?

Is it positive, negative, zero, or undefined?

## 10.3 Even Answers

28) a) circle, radius 5, center (2,3)

$$\text{Cartesian (Rectangular)} : (x-2)^2 + (y-3)^2 = 25$$

$$\text{Parametric} : x = 5\cos t + 2, y = 5\sin t + 3$$

b) circle, radius 4, center at origin

$$\text{Polar} : r = 4$$

56) a) V b) II c) VI d) III e) I f) IV

$$58) \frac{dy}{dx} \Big|_{\theta = \frac{\pi}{3}} = \frac{2 - \sqrt{3}}{1 - 2\sqrt{3}} = \frac{1 - \sqrt{3}/2}{-\sqrt{3} + \frac{1}{2}}$$

$$60) \frac{dy}{dx} \Big|_{\theta = \pi} = \frac{-1/2}{\sqrt{3}/6} = \frac{-3}{\sqrt{3}} = -\sqrt{3}$$

$$62) \frac{dy}{dx} \Big|_{\theta = \frac{\pi}{3}} = \frac{1 + \sqrt{3}/2}{-\sqrt{3} - \sqrt{3}/2} = \frac{2 - 3}{-2\sqrt{3} - \sqrt{3}} = \frac{-1}{-3\sqrt{3}} = \frac{\sqrt{3}}{9}$$

## Polar Worksheet Answers

①  $r = 2$

$$\frac{dr}{d\theta} \Big|_{\theta=0} = 0$$

$$\frac{dy}{dx} \Big|_{\theta=0} = \infty$$

$$\frac{dr}{d\theta} \Big|_{\theta=\frac{\pi}{4}} = 0$$

$$\frac{dy}{dx} \Big|_{\theta=\frac{\pi}{4}} = -1$$

★ For each derivative consider the result graphically. Do this for each problem.

②  $r = 2 \cos \theta$

$$\frac{dr}{d\theta} \Big|_{\theta=0} = 0$$

$$\frac{dy}{dx} \Big|_{\theta=0} = \infty$$

$$\frac{dr}{d\theta} \Big|_{\theta=\frac{\pi}{4}} = -\sqrt{2}$$

$$\frac{dy}{dx} \Big|_{\theta=\frac{\pi}{4}} = 0$$

★ Be sure to also do Part III on separate paper. What did you learn from this?

③  $r = 2 \sin 2\theta$

$$\frac{dr}{d\theta} \Big|_{\theta=0} = 4$$

$$\frac{dy}{dx} \Big|_{\theta=0} = 0$$

$$\frac{dr}{d\theta} \Big|_{\theta=\frac{\pi}{4}} = 0$$

$$\frac{dy}{dx} \Big|_{\theta=\frac{\pi}{4}} = -1$$

④  $r = 2 \cos \theta + \frac{1}{2}$

$$\frac{dr}{d\theta} \Big|_{\theta=0} \rightarrow \text{zero}$$

$$\frac{dy}{dx} \Big|_{\theta=0} \rightarrow \text{Undefined}$$

$$\frac{dr}{d\theta} \Big|_{\theta=\frac{\pi}{3}} \rightarrow \text{Negative}$$

$$\frac{dy}{dx} \Big|_{\theta=\frac{\pi}{3}} \rightarrow \text{Positive}$$

$$\frac{dx}{d\theta} \Big|_{\theta=\frac{\pi}{3}} \rightarrow \text{Negative}$$

$$\frac{dy}{d\theta} \Big|_{\theta=\frac{\pi}{3}} \rightarrow \text{Negative}$$

$$\frac{d^2y}{dx^2} \Big|_{\theta=\frac{\pi}{3}} \rightarrow \text{Negative}$$

Do this type of analysis for #1, 2, and 3.