# Chapter 6 Part 1

Test Review

At the beginning of 2010, a landfill contained 2200 tons of solid waste. The increasing function W models the total amount of solid waste stored at the landfill. Planners estimate that W will satisfy the differential equation $\frac{dw}{dt} = \frac{1}{20}(W - 200)$ for the next 20 years. W is measured in tons, t is measured in years from the start of 2010.

Use the line tangent to the graph of W at t = 0 to approximate the amount of solid waste that the landfill contains at the end of the first 6 months of 2010 $\left(t = \frac{1}{2}\right)$

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Find $\frac{d^2w}{dt^2}$ in terms of W. Use $\frac{d^2w}{dt^2}$ to determine whether your answer in part a is an underestimate or an overestimate of the amount of solid waste that the landfill contains at time $\left(t = \frac{1}{2}\right)$

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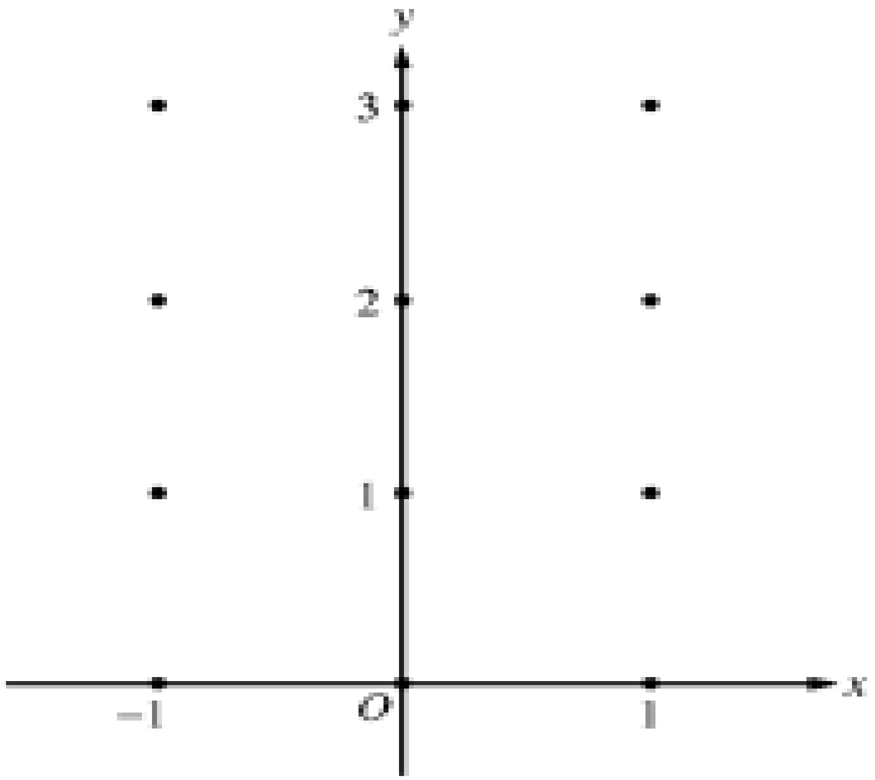
Find the particular solution W=W(t) to the differential equation

$\frac{dw}{dt} = \frac{1}{20}(W - 200)$ with initial condition W(0) = 2200.

Consider the differential equation $\frac{dy}{dx} = x^3(y-1)$

On the axis provided, sketch a slope field for the given differential equation at the twelve points indicated. Then sketch a possible solution through the point (0, 2).



Consider the differential equation $\frac{dy}{dx} = x^3(y-1)$

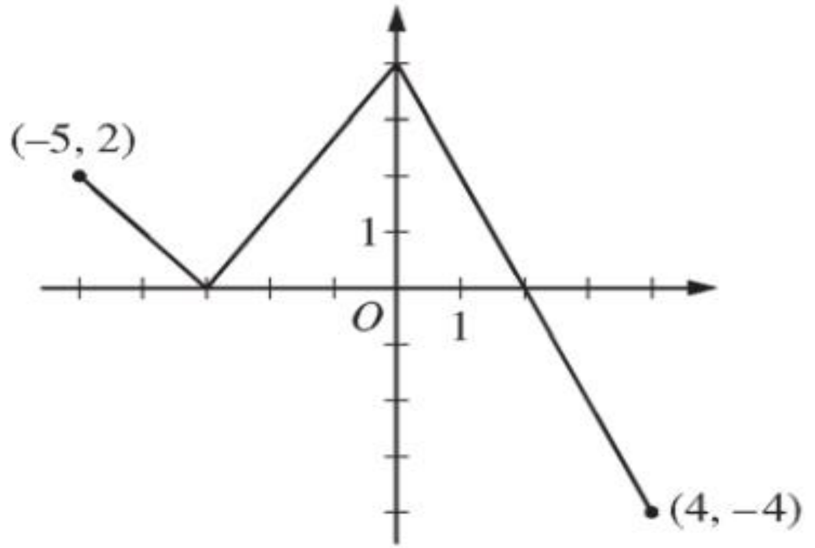
Find the particular solution y = f(x) to the given differential equation with the initial condition f(0) = 0.

Consider the differential equation $\frac{dy}{dx} = x^3(y-1)$

- Use Euler's Method, starting at f(0) = 0, with 2 steps of equal size to approximate f(1). Show the computations that lead to your answer.

Let f be the differentiable function whose graph is shown in the figure. The position, in meters, at time t (sec) of a particle moving along a horizontal coordinate axis is given by $s(t)=\int_0^x f(t)dt$ Use the graph of f(x) below to answer the questions.

a. Find the velocity of the particle at t = 4.




Graph of $f$

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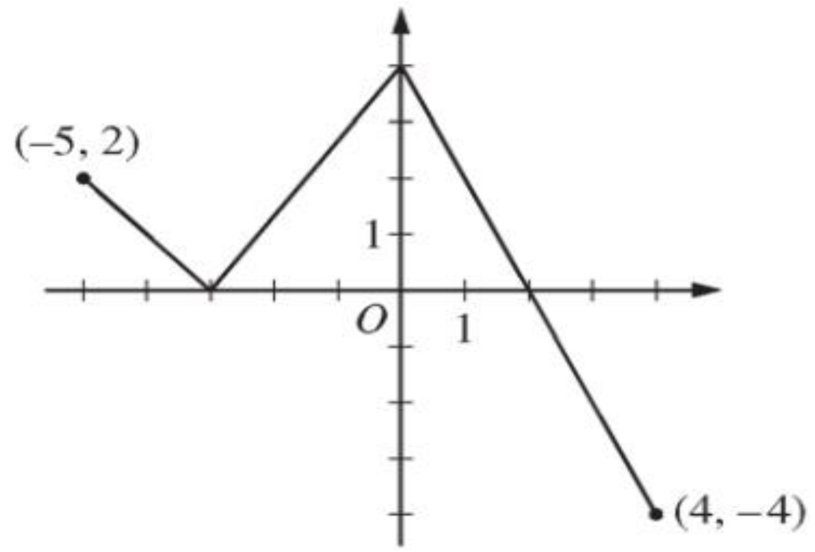
b. Find the position of the particle at t = 4.

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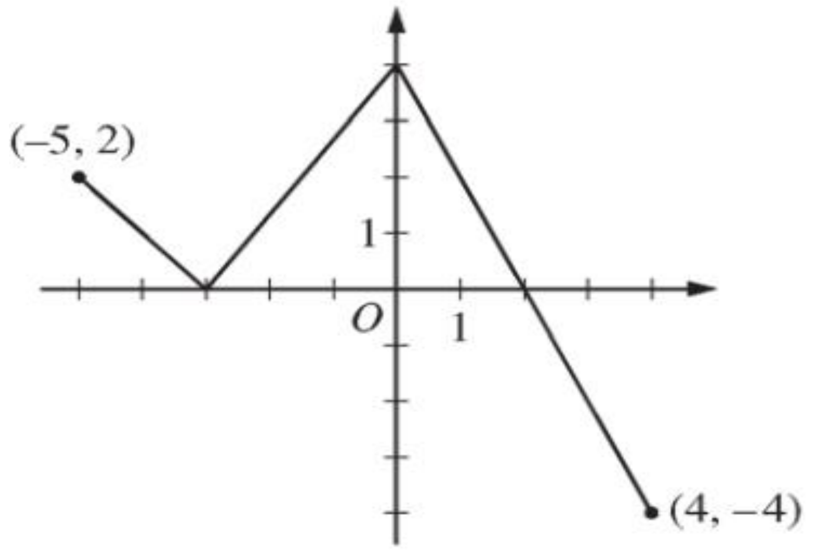
c. At what time does s(t) attain its absolute minimum and maximum value? Justify your answer.

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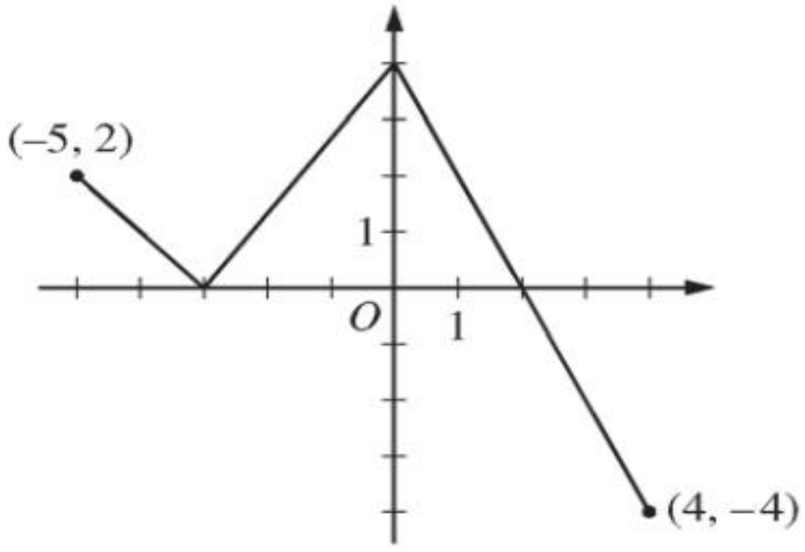
d. For what values of t is the particle moving to the right? Justify your answer.

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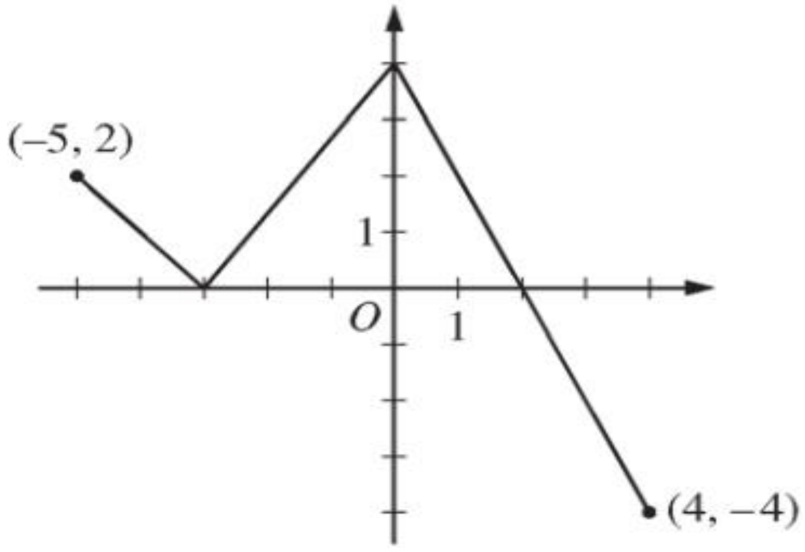
e. Approximately when is the acceleration of the particle negative? Justify your answer.

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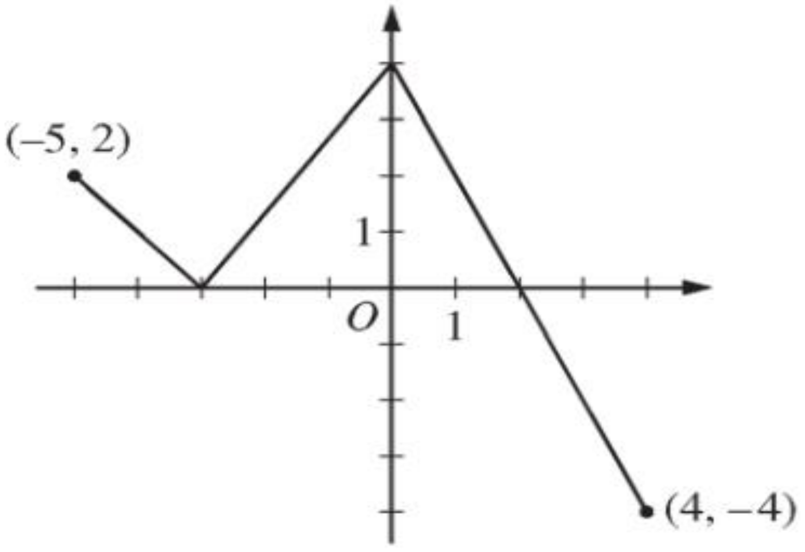
f. Write the equation of the line tangent to s(t) at t = 4.




Graph of $f$

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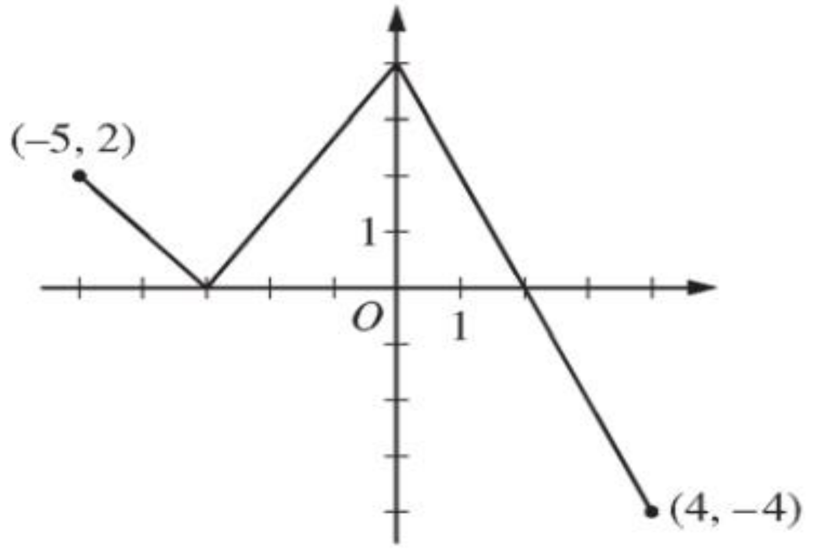
g. Determine any points of inflection for the graph of s(t). Justify your answer.




Graph of $f$

# Solve the initial value problem given below

$$\frac{dy}{dx} = \frac{2 - x^2}{3y} \quad \text{and } y(0) = 1$$

# Solve the initial value problem given below

$$\frac{dy}{dx} = y + 2 \quad \text{and } y(0) = 2$$

Find the general solution to the differential equation given below

$$\frac{dy}{dx} = x^2 + \frac{1}{x^5}$$

# Find the general solution to the differential equation given below p. 327 #1

$$\frac{dy}{dx} = 5x^4 - \sec^2 x$$

Find the general solution to the differential equation given below p. 327 #3

$$\frac{dy}{dx} = \sin x - e^{-x} + 8x^3$$

# Find the general solution to the differential equation given below

$$\frac{dy}{dx} = \frac{1}{1+x^2} - \frac{1}{\sqrt{x}}$$

# Find the general solution to the differential equation given below p. 326 7

$$\frac{dy}{dx} = 3x^2 \cos\left(x^3\right)$$

Find the general solution to the differential equation given below p. 326 10

$$\frac{dy}{dx} = 4(\sin x)^3 \cos x$$

# Solve the initial value problem    p. 326 12

$$\frac{dy}{dx} = 2e^{x} - \cos x \qquad \text{and } \mathrm{y}(0) = 3$$

# Solve the initial value problem p. 326 13

$$\frac{dy}{dx} = 7x^6 - 3x^2 + 5 \qquad \text{and } y(1) = 1$$

# Solve the initial value problem p. 326 13

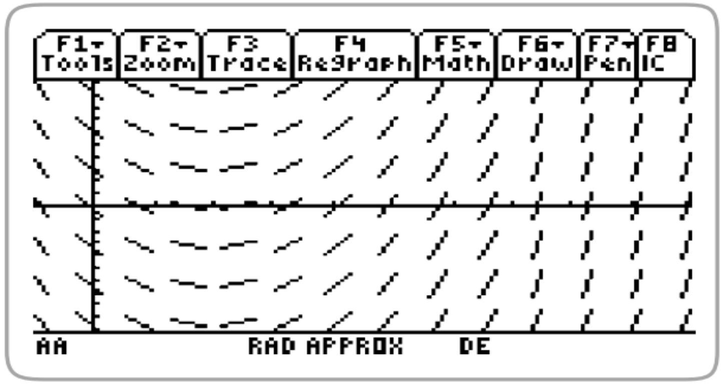
$$\frac{dy}{dx} = \frac{-1}{x^2} - \frac{3}{x^4} + 12 \quad \text{and } y(1) = 3$$

## Multiple-Choice Questions

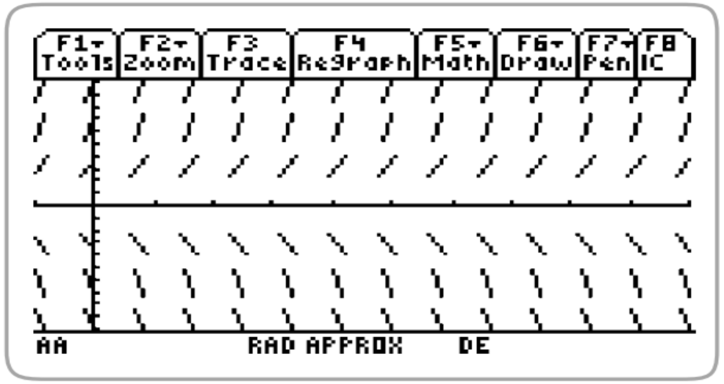
*A graphing calculator is required for some questions.*

**1.** Which is the slope field for the differential equation $\frac{dy}{dx} = 2y - 4$?

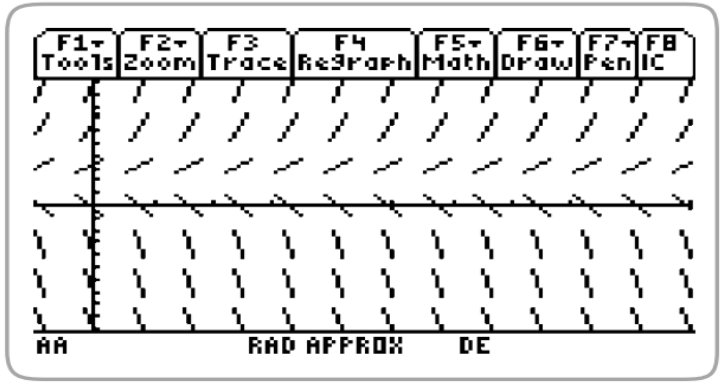
(A)



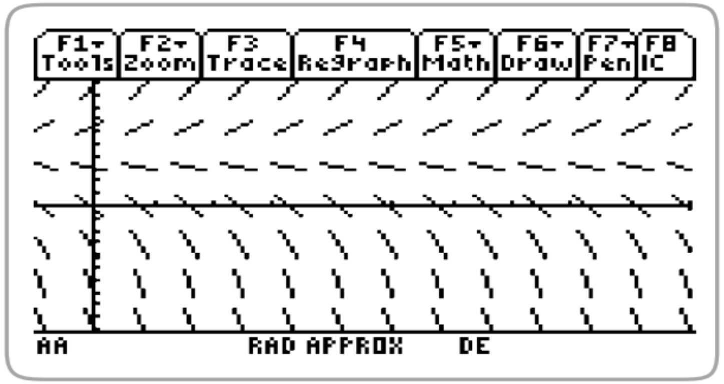

(B)




(C)




(D)




(E)