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(27)

$$\int \frac{x^2+x+1}{\sqrt{x}}\,dx$$

$$\int \frac{x^2}{x^{1/2}}\,dx + \int \frac{x}{x^{1/2}}\,dx + \int \frac{1}{x^{1/2}}\,dx$$

$$\int x^{3/2}\,dx + \int x^{1/2}\,dx + \int x^{-1/2}\,dx$$

$$\frac{2x^{5/2}}{5} + \frac{2x^{3/2}}{3} + 2x^{1/2} + C$$

Notes

(7)

$$\frac{d}{dx}\int(\sec x \tan x)\,dx$$

$\sec x \tan x$

Particular Solution

what is $f(x)$?

① $f'(x) = 6x$ $\quad f(0) = 3$

$f(x) = 3x^2 + C$

$3 = 3(0)^2 + C$

$3 = C$

$$\boxed{f(x) = 3x^2 + 3}$$

(2) $f''(x) = 3$ $\quad f'(1) = 2$ $\quad f(1) = 0$

$f'(x) = 3x + C$

$2 = 3(1) + C$

$-1 = C$

$f'(x) = 3x - 1$

$f(x) = \frac{3x^2}{2} - x + C$

$0 = \frac{3}{2} - 1 + C$

$-\frac{1}{2} = C$

$f(x) = \frac{3}{2}x^2 - x - \frac{1}{2}$

$v(0) = 64$ ft

$s(0) = 80$ ft

Find the Position Function.

$a(t) = -32$

$v(t) = -32t + C$

$64 = -32(0) + C$

$64 = C$

$v(t) = -32t + 64$

$s(t) = -16t^2 + 64t + C$

$s(t) = -16t^2 + 64t + 80$

b) $0 = -16t^2 + 64t + 80$

$0 = -16(t^2 - 4t - 5)$

$0 = -16(t-5)(t+1)$

$t = 5, \cancel{-1}$

$t = 5$ sec

Section 4.1B – Antidifferentiation and Slope Fields

Objectives:
1. Find the families of antiderivatives using slope fields.
2. Find a particular solution of a differential equation.

I. Solution Curves and Slope Fields

A. What does $\frac{dy}{dx} = 2x$ represent?

1. Since we do not know what slopes we are dealing with we draw all the possible slopes or slope fields.

2. If we antidifferentiate how do we know which graph represents the original?

we need some type of conditions!

B. Questions:

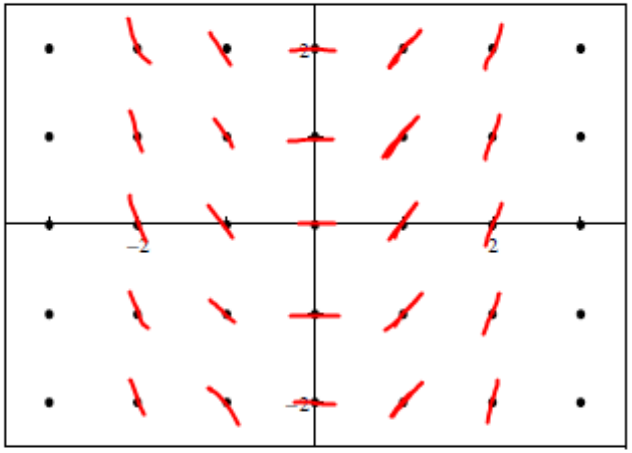
1. What is a slope field?

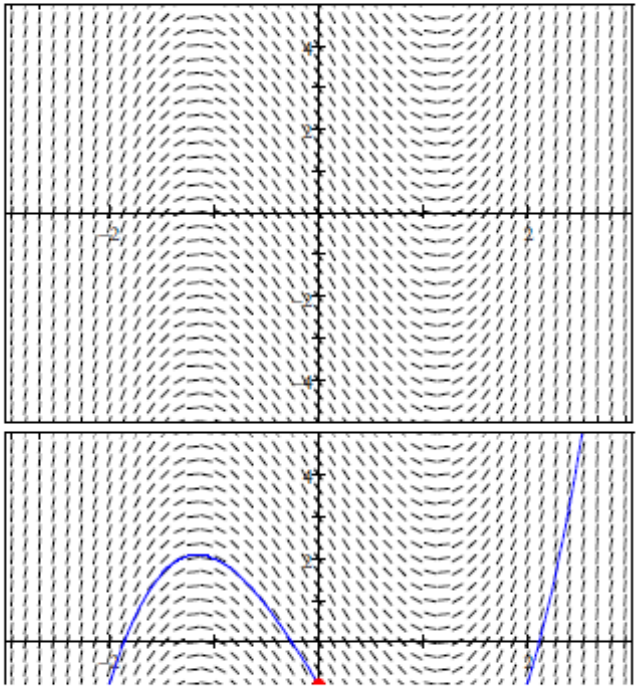
A slope field is the graphical representation of a differential equation.

2. What Do Slope Fields Show You?

The solution curves are hiding in the slope field. Given one point of the particular solution curve, you can sketch the graph from that point, in both directions, to see the graph of the solution.

Do Calculator Lab #11





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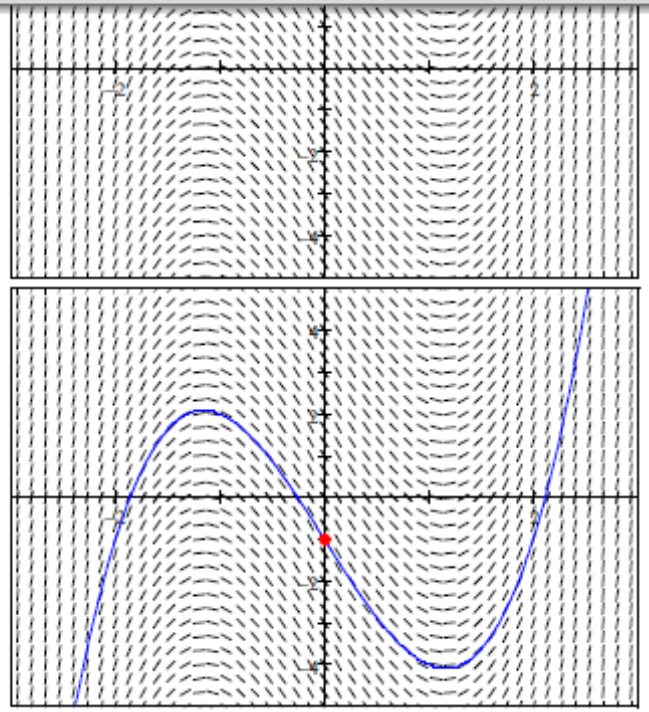

II. Initial Conditions and Particular Solutions

A. Examples:

1. Find the equation of the curve whose slope at a point (x, y) is $3x$, if the curve is required to pass through the point $(1,-1)$.

$\int 3x\,dx = \frac{3}{2}x^2 + C$ $C = -2\frac{1}{2}$

$-1 = \frac{3}{2}(1)^2 + C$ $y = \frac{3}{2}x^2 - 2\frac{1}{2}$

2. A heavy projectile is fired straight up from a platform 10 feet above the ground with an initial velocity of 160 ft/s. Assume that the only force affecting the projectile during its flight is gravity, which produces a downward acceleration of 32 ft/s^2. Find an equation for the projectile's height above the ground as a function of time, if $t = 0$ when the projectile is fired.

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$\int -32\,dt = -32t + C$

$\int -32t + 160\,dt =$

$-16t^2 + 160t + C = s(t)$

$-16t^2 + 160t + 10 = s(t)$

Homework:
Slope Field Worksheet and p. 248 ~~49-54 all, 56, 59, 61, 64, 65, 70, 84, 87, 92-96 all~~

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47, 49-54

Worksheet – Slope Fileds

With out your graphing utilities or programs graph the slope field for the following differentials.

$\frac{dy}{}$ $\frac{dy}{}$

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$$\int (\tan^2 y + 1)\, dy$$

$$\int \sec^2 y\, dy$$

$$\boxed{\tan y + C}$$

① $\cos^2 x + \sin^2 x = 1$

$\sin^2 x = 1 - \cos^2 x$

$\cos^2 x = 1 - \sin^2 x$

② $1 + \tan^2 x = \sec^2 x$

$1 = \sec^2 x - \tan^2 x$

$\tan^2 x = \sec^2 x - 1$

③ $\cot^2 x + 1 = \csc^2 x$