§1.2 cont

Example

$$\frac{dy}{dx} = \frac{2}{\sqrt{\pi}} e^{-x^2}$$

$$y(0) = 0$$

Solution $$y(x) = \frac{2}{\sqrt{\pi}} \int_0^x e^{-u^2} du$$

$$\frac{dy}{dx} > 0 \quad \text{for} \quad \text{all} \quad x$$

Solution $y(x)$ always increases

$$\frac{d^2y}{dx^2} = \frac{2}{\sqrt{\pi}} e^{-x^2}(-2x)$$

< 0 if $x > 0$

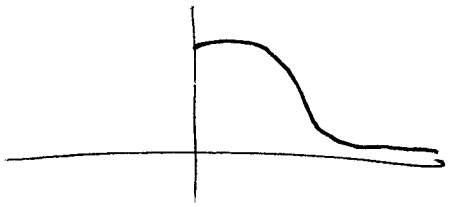
> 0 if $x < 0$

$y(x)$ concave down if $x > 0$

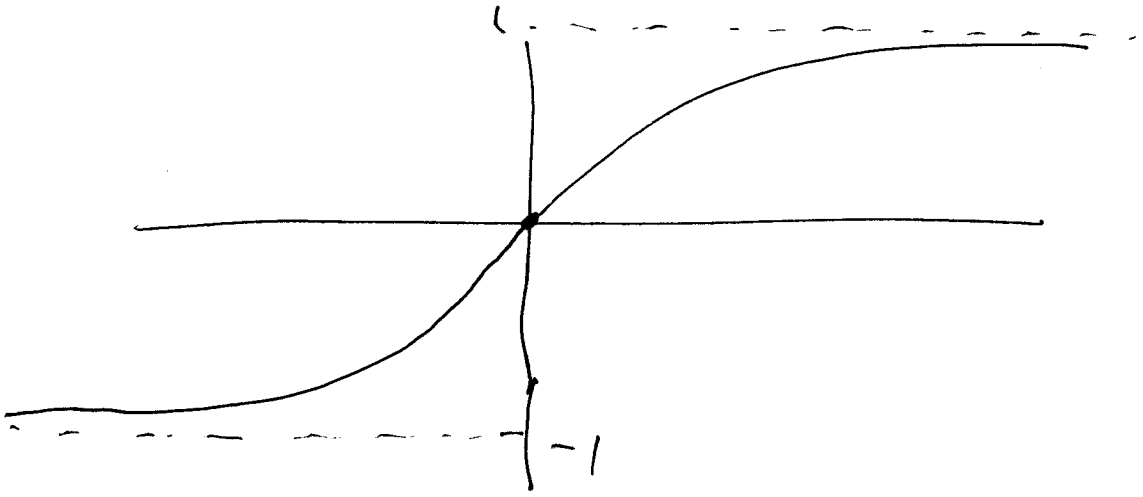
concave up if $x < 0$

What happens as $x \to \infty$

$$\frac{2}{\sqrt{\pi}} \int_0^{\infty} e^{-u^2} \, du$$



$= 1$ (numerical "fact")



1.3 Slope fields

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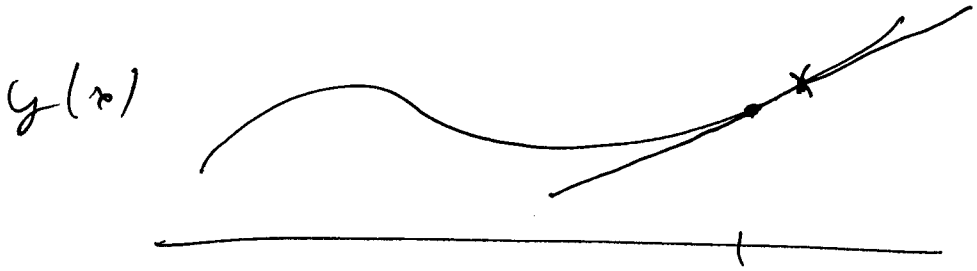
3

Good for

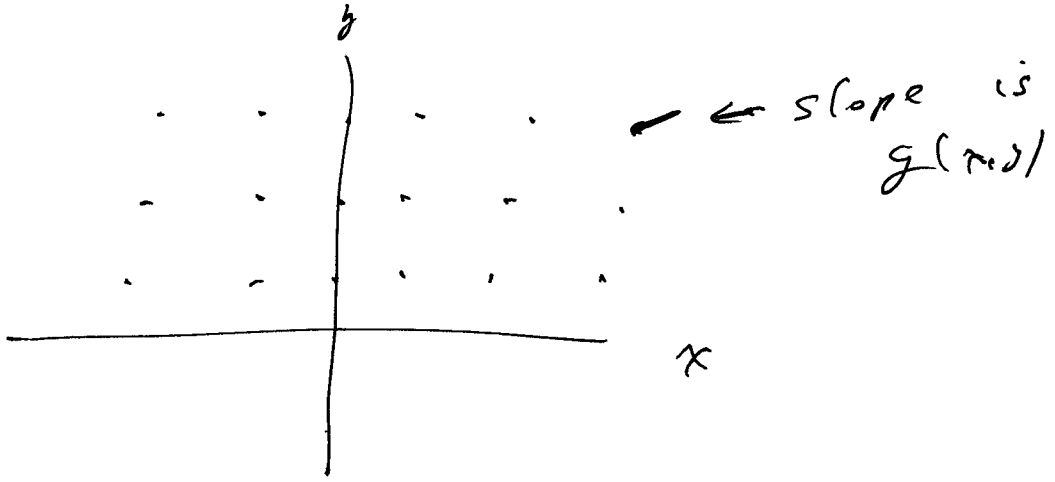
$$\frac{dy}{dx} = g(x, y)$$

Graphical technique



Known $y(x)$

$$y(x + \Delta x) \approx y(x) + \frac{dy}{dx}(x) \cdot \Delta x$$



Example $g(x,y) = \cos x$

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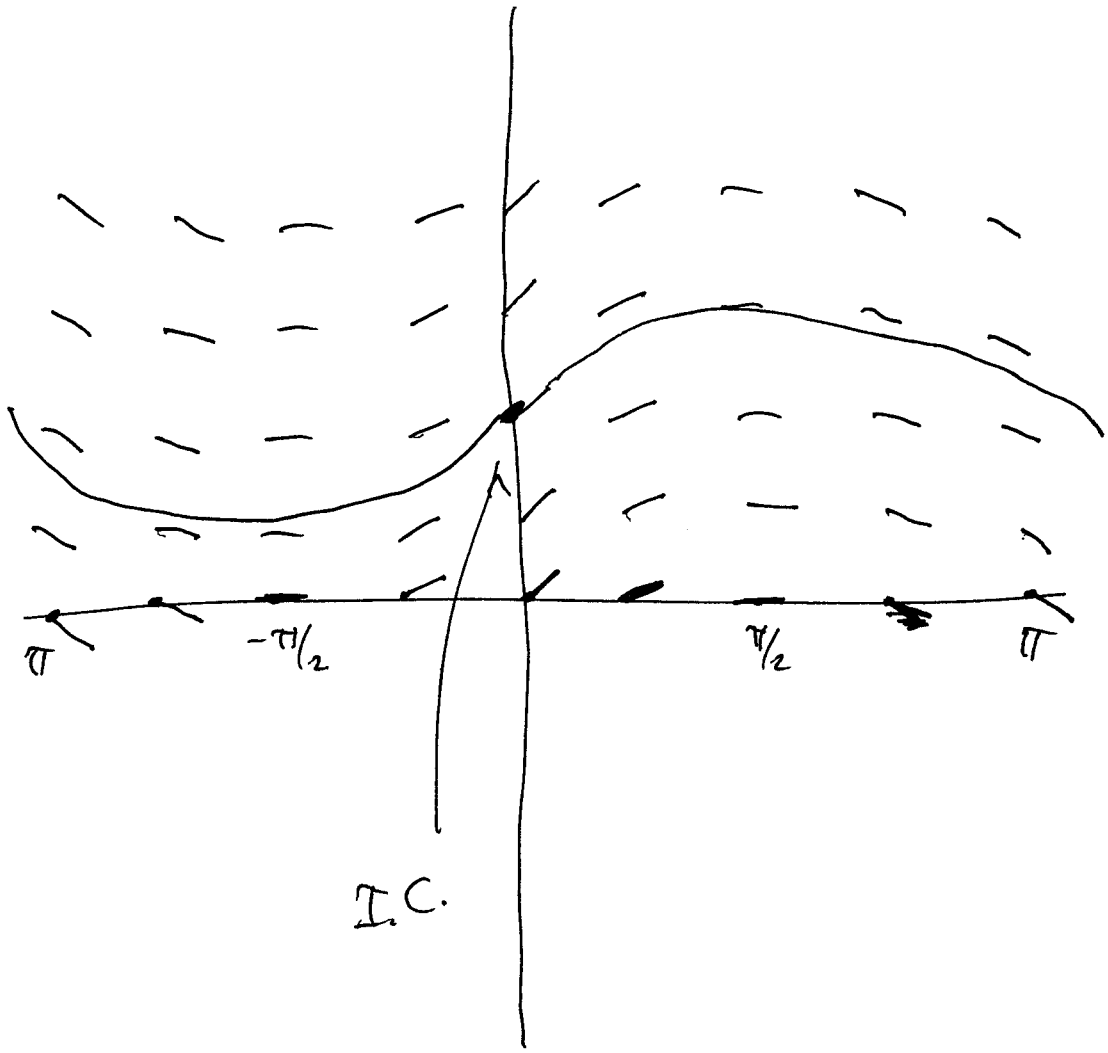
4



$y(x) = \sin x + C$

ilc class

Go cats 08!

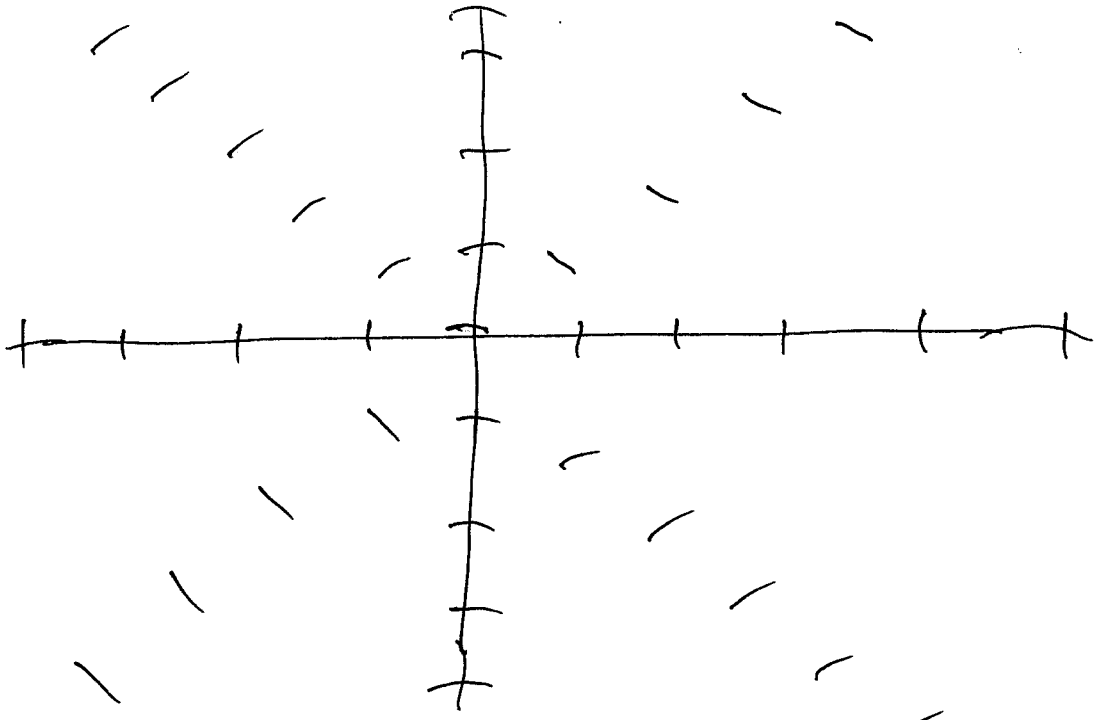
math.arizona.edu/~tgk/250a

$$g(x) = \frac{2}{\sqrt{\pi}} e^{-x^2}$$

$$= 1.12\, e^{-x^2}$$

9/10
5'

$$\frac{dy}{dx} = -\frac{x}{y}$$



Cook likes $y = \sqrt{1-x^2}$

is a solution

$x^2 + y^2 = 1$ [9/10 6]

Is $y = \sqrt{1-x^2}$ a solution?

$$\frac{dy}{\sqrt{x}} = \frac{1}{2}(1-x^2)^{-1/2}(-2x)$$

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

$$\frac{-x}{y} = \frac{-x}{\sqrt{1-x^2}}$$

equal

So yes it satisfies dif. eq.