HW 3 written 27 B 30

27. $y' = 2\sqrt{y}$ B $y(0) = 0$

$$y(x) = \begin{cases} 0 & x \le c \\ (x-c)^2 & x > c \end{cases}$$

a) $$y'(x) = \begin{cases} 0 & x \le c \\ 2x - 2c & x > c \end{cases}$$

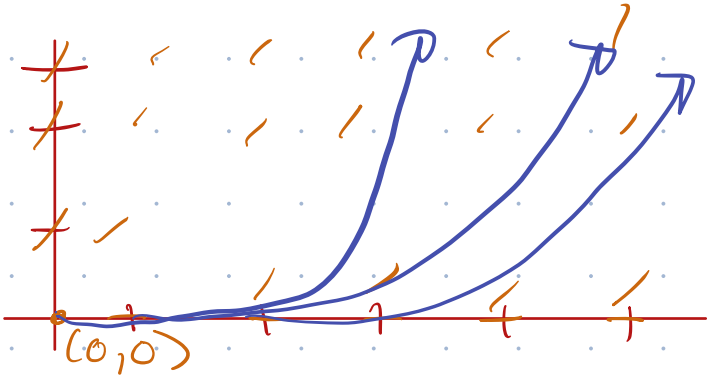
this y satisfies DE for $x \le c$ [$y' = 2\sqrt{y}$ } just in 0 from $x \le c$

$0 = 2\sqrt{0}$

$y' = 2\sqrt{y}$

$2x - 2c = 2\sqrt{(x-c)^2}$

$2x - 2c = 2x - 2c$ ✓ satisfies given DE for $x > c$



b) initial value problem ($y(a)=b$) has no solution for $b < 0$

the initial value problem ($y(a)=b$) has a unique solution for $b > 0$

30. $y' = -\sqrt{1-y^2}$ $\quad y(a)=b$

$$y(x) = \begin{cases} 1 & x \le c \\ \cos(x-c) & c < x < c+\pi \\ -1 & x \ge c+\pi \end{cases}$$

$$y'(x) = \begin{cases} 0 & x \le c \\ -\sin(x-c) & c < x < c+\pi \\ 0 & x \ge c+\pi \end{cases}$$

$x \le c$: $\quad y' = -\sqrt{1-y^2}$

$0 = -\sqrt{1-1^2}$

$0 = 0$ ✓ satisfies DE

$c < x < c+\pi$: $\quad y' = -\sqrt{1-y^2}$

$-\sin(x-c) = -\sqrt{1-(\cos(x-c))^2}$

$= -\sqrt{1-\cos^2}$

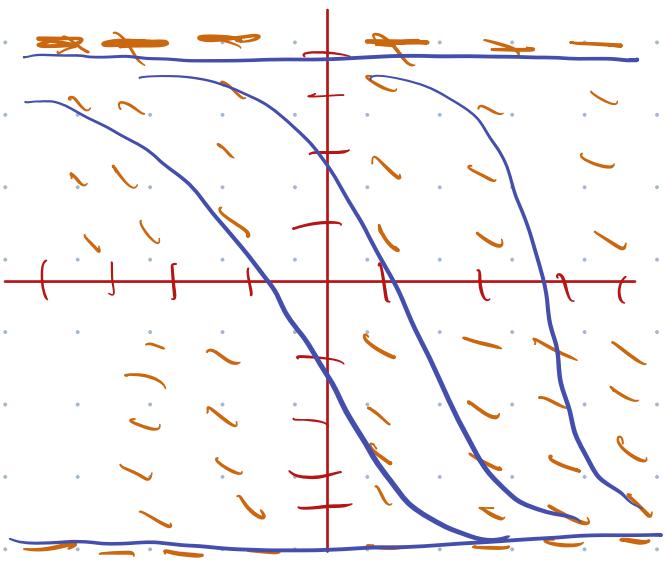
$= -\sin$

$-\sin(x-C) = -\sin(x-C)$ ✓ satisfies DE

$x = C + \pi$: $y' = -\sqrt{1-y^2}$

$0 = -\sqrt{1-1^2}$

$0 = 0$ ✓ satisfies DE



IVP has no solution if $y(b)$ $|b| > 1$

yay :) IVP has unique solution if $|b| < 1$

IVP has infinite sol if $|b| = 1$