Good afternoon: warm up Find the general solution, y

$y'=2x^2(2y-1)$

$\frac{dy}{dx} = 2x^2(2y-1)$

$dy = 2x^2(2y-1)\,dx$

get x with dx, get y with dy

$\int \frac{dy}{2y-1} = \int 2x^2\,dx$

calculus (integration)

rev chain rule

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

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

$\ln(2y-1) = \frac{4}{3}x^3 + C$

exponentiation

$e^{\frac{4}{3}x^3+C} = 2y-1$

$e^C e^{\frac{4}{3}x^3} = 2y-1$

$Ce^{\frac{4}{3}x^3} = 2y-1 \rightarrow$

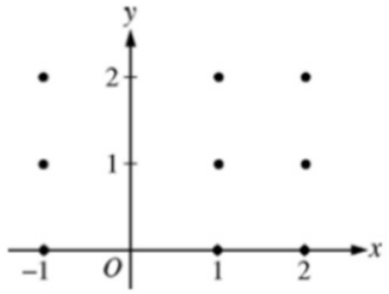
$Ce^{\frac{4}{3}x^3} + 1 = 2y$

$Ce^{\frac{4}{3}x^3} + \frac{1}{2} = y$

# Flashback!

5. Consider the differential equation $\frac{dy}{dx} = \frac{y-1}{x^2}$, where $x \neq 0$.

(a) On the axes provided, sketch a slope field for the given differential equation at the nine points indicated.
**(Note: Use the axes provided in the exam booklet.)**




(b) Find the particular solution $y = f(x)$ to the differential equation with the initial condition $f(2) = 0$.

(c) For the particular solution $y = f(x)$ described in part (b), find $\lim_{x \to \infty} f(x)$.

$\frac{dy}{dx} = \frac{y-1}{x^2}$, where $x \neq 0$.

(b) Find the particular solution $y = f(x)$ to the differential equation with the initial condition $f(2) = 0$.

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(2, 0)

(b)

$x^2 dy = (y-1)\,dx$

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

$\int \frac{1}{y-1} \cdot dy = \int x^{-2} \cdot dx$

$\ln(y-1) = -x^{-1} + C$

$e^{\ln(y-1)} = e^{-x^{-1}+C}$

$e^{-x^{-1}+C} = e^{-x^{-1}} \cdot e^{C}$

general solution, then plug in given point to find C

$Ce^{-x^{-1}} = y - 1 \rightarrow$

$y = Ce^{-x^{-1}} + 1$

gen. solution

(2, 0)

$0 = Ce^{-2^{-1}} + 1$

$-1 = \frac{Ce^{\frac{1}{2}}}{e^{-1/2}}$

$C = -e^{1/2}$

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

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

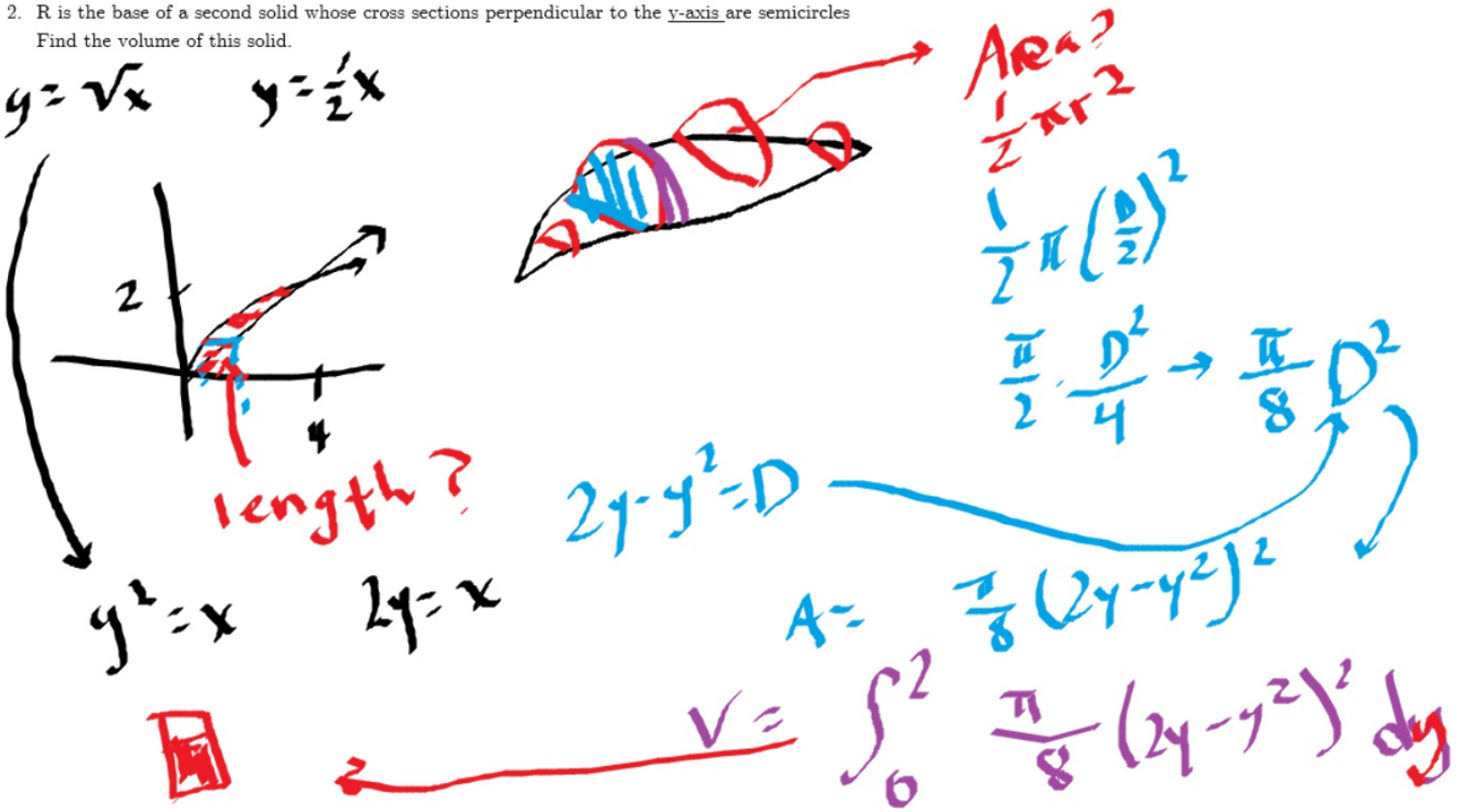
(c) $\lim_{x \to \infty} 1 - e^{\frac{1}{2} - \frac{1}{x}}$

$1 - e^{\frac{1}{2} - \frac{1}{\infty}}$

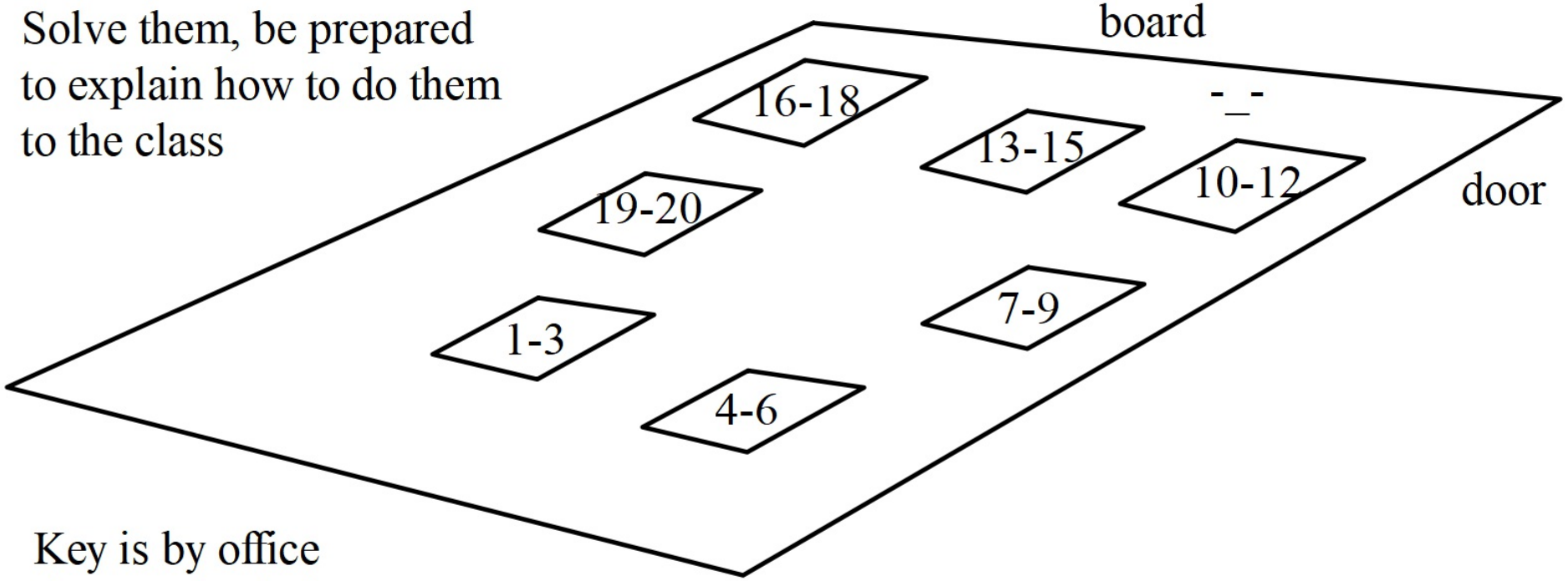
$1 - e^{1/2} \Rightarrow 1 - \sqrt{e}$

# What questions do you have from the practice assessment?

2. R is the base of a second solid whose cross sections perpendicular to the y-axis are semicircles
   Find the volume of this solid.



Each group is assigned problems
Solve them, be prepared
to explain how to do them
to the class




Key is by office
door to check :)

HW
practice assessment
no timed FRQ tomorrow: use DS for studying, review, retake, project, etc.