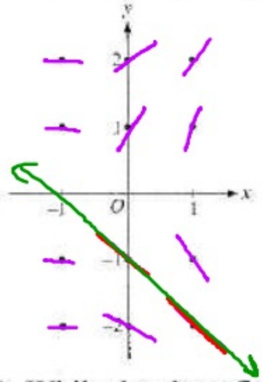
5. Consider the differential equation $\frac{dy}{dx} = \frac{x+1}{y}$

a) On the axes provided, sketch a slope field for the given differential equation at the twelve points indicated and for -1< x < 1, sketch the solution curve passing through the point (0, -1).



b) While the slope field in part (a) is drawn at only twelve points, it is defined at every point in the xy-plane for which $y \neq 0$. Describe all points in the xy-plane, $y \neq 0$, for which $\frac{dy}{dx} = -1$

$$\boxed{y = -1x - 1}$$

c) Find the particular solution y = f(x) to the given differential equation with the initial condition f(0) = -2.

$$\cancel{(dx)}\ \frac{dy}{\cancel{dx}} = \frac{x+1}{y}\ (dx)$$

$$(y)\ dy = \frac{(x+1)}{y}\ dx\ (y)$$

$$\int y\ dy = \int (x+1)\ dx$$

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

$$2 = C$$

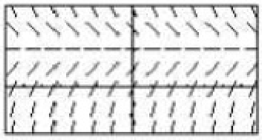
$$\frac{1}{2}y^2 = \frac{1}{2}x^2 + x + 2$$

$$y^2 = x^2 + 2x + 4$$

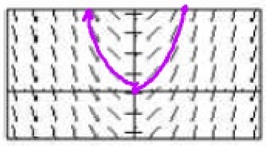
$$\boxed{y = -\sqrt{x^2 + 2x + 4}}$$

Match the following differential equation with the correct slope field

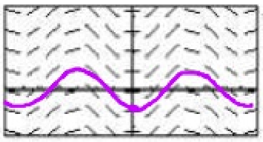
(A) #9



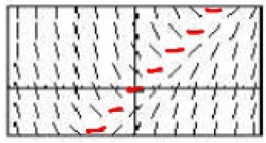
(B) #10



(C) #7



(D) #8



7. $\boxed{\frac{dy}{dx} = \sin x}$ 8. $\frac{dy}{dx} = x - y$ 9. $\frac{dy}{dx} = 2 - y$ 10. $\frac{dy}{dx} = x$

$y = -\cos x + C$

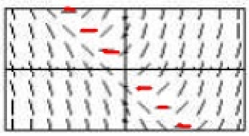
$y = x$

$\frac{dy}{dx} = 0$

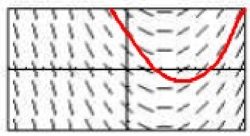
$y = 2 \quad \frac{dy}{dx} = 0$

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

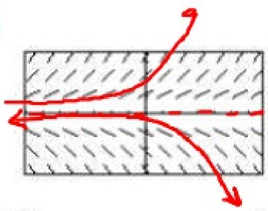
(A) #14



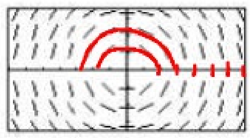
(B) #11



(C) #12



(D) #13



11. $\frac{dy}{dx} = 0.5x - 1$ 12. $\frac{dy}{dx} = 0.5y$ 13. $\frac{dy}{dx} = -\frac{x}{y}$ 14. $\frac{dy}{dx} = x + y$

y = Quadratic

$y \neq 0$

$\frac{dy}{dx} = 0$

y and x opp.

$\int \frac{dy}{y} = \int .5\,dx$

$\ln y = .5x + C$

$y = Ce^{.5x}$

$\int y\,dy = \int -x$

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

$y^2 = -x^2 + C$

$y = \pm\sqrt{-x^2 + C}$

Rewrite each definite integral in terms of u and du	1. $\boxed{\int_{x=0}^{x=1}(5x+4)^5\,dx}$ Let $u = 5x+4$ $\frac{du}{dx} = 5$ $du = 5\,dx$ $\frac{du}{5} = dx$ $\int_4^9 u^5\,dx$ $\int_4^9 u^5 \frac{du}{5}$ $\boxed{\int_4^9 \frac{1}{5}u^5\,du}$ 2. $\boxed{\int_0^2 3x^2(x^3+4)^5\,dx}$ Let $u = x^3+4$ $\left(\frac{du}{dx}\right) = 3x^2$ $\int_4^{12}(3x^2)(u)^5\,dx$ $\int_4^{12}\left(\frac{du}{dx}\right)u^5\,dx$ $\boxed{\int_4^{12} u^5\,du}$

	3. $\int_1^3 \cos(2x+1)\,dx$ Let u = 2x + 1 $\rightarrow \frac{du}{dx} = 2$ $\frac{du}{2} = dx$ $\int_3^7 \cos(u)\,dx$ $\int_3^7 \cos(u)\,\frac{du}{2} = \int_3^7 \frac{1}{2}\cos(u)\,du = \frac{1}{2}\int_3^7 \cos(u)\,du$ 4. $\int_0^{\pi/4} \frac{\sin x}{(\cos x)^5}\,dx$ Let u = cosx $\quad \frac{du}{dx} = -\sin x$ $\frac{du}{-\sin x} = dx$ $\int_1^{\sqrt{2}/2} \frac{\sin x}{u^5}\,dx$ $\int_1^{\sqrt{2}/2} \frac{\sin x}{u^5} \cdot \frac{du}{-\sin x} = \int_1^{\sqrt{2}/2} \frac{-1}{u^5}\,du = \boxed{\int_1^{\sqrt{2}/2} -u^{-5}\,du}$ $= \int -\frac{du}{u^5}$