Warm UP: Name: key Period: ______________

$xy\frac{dy}{dx} = \frac{\ln x}{\sqrt{1-y^2}}$, Find a general solution. Write your answer in the form of y(x)= .

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

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

$u = 1-y^2$ | $u = \ln x$
$du = -2y\,dy$ | $du = \frac{1}{x}dx$
$y\,dy = -\frac{1}{2}du$

$-\frac{1}{2}\int \sqrt{u}\,dy = \int u\,du$

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

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

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

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

$y = \pm\sqrt{1 - \left[D - \frac{3}{2}(\ln x)^2\right]^{\frac{2}{3}}}$

1. 4 Integrations

2. Two slope fields.

3. One differential Equation (DE)

4. One application problem (DE)

5. One application (DE) using $a = \frac{dv}{ds} \cdot v$

practice) $a = 3s^2 + 1$.

where s is the displacement in meters.

Find the expression of v in terms of s

when $s = 1$ meter, $v = 2 \frac{m}{s}$.

$$\frac{dv}{ds} \cdot v = 3s^2 + 1$$

$$\int v \cdot dv = \int (3s^2 + 1)\, ds$$

$$\frac{1}{2} v^2 = s^3 + s + C$$

$$2 = 2 + C \Rightarrow C = 0$$

$$\Rightarrow v = \pm\sqrt{2s^3 + 2s}$$