8.1 supplemental HW

1.) Which of the following could be the general solution to the differential equation whose direction field is given below:

A) $y = t + C$

B) $y = 2t + C$

C) $y = \frac{1}{2}t + C$

D) $y = -\frac{1}{2}t + C$

E) $y = -t + C$

F) $y = -2t + C$

G) $y = ln|t| + C$

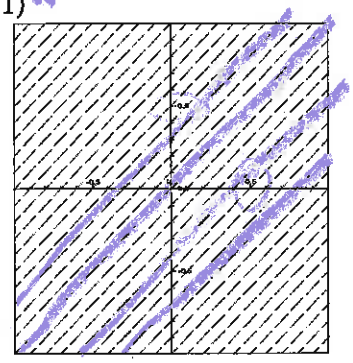
H) $y = C$

I) $y = \frac{Ct^3}{3}$

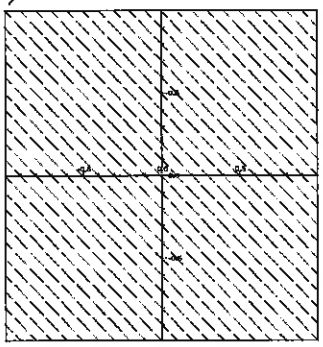
J) $y = \frac{t^3}{3} + C$

K) $x^2 + y^2 = C$

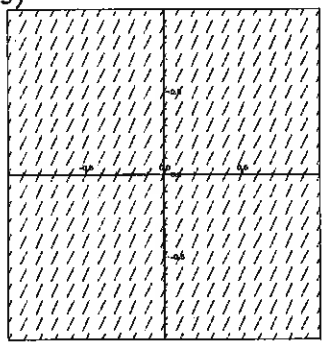
1)



2)



3)



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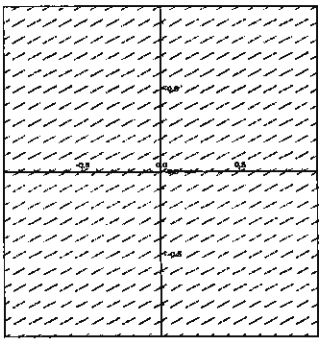

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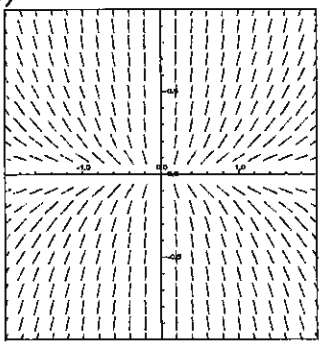

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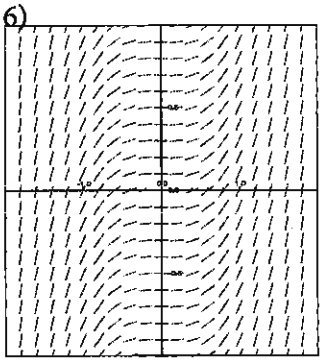
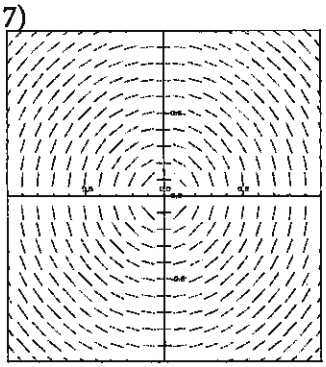


7)

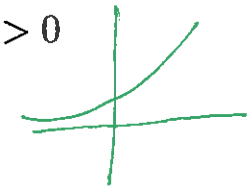


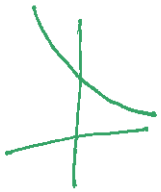
Section 2.5: Autonomous equations: $y' = f(y)$

Example: Exponential Growth/Decay

Example: population growth/radioactive decay

$y' = ry$, $y(0) = y_0$ implies $y = y_0 e^{rt}$

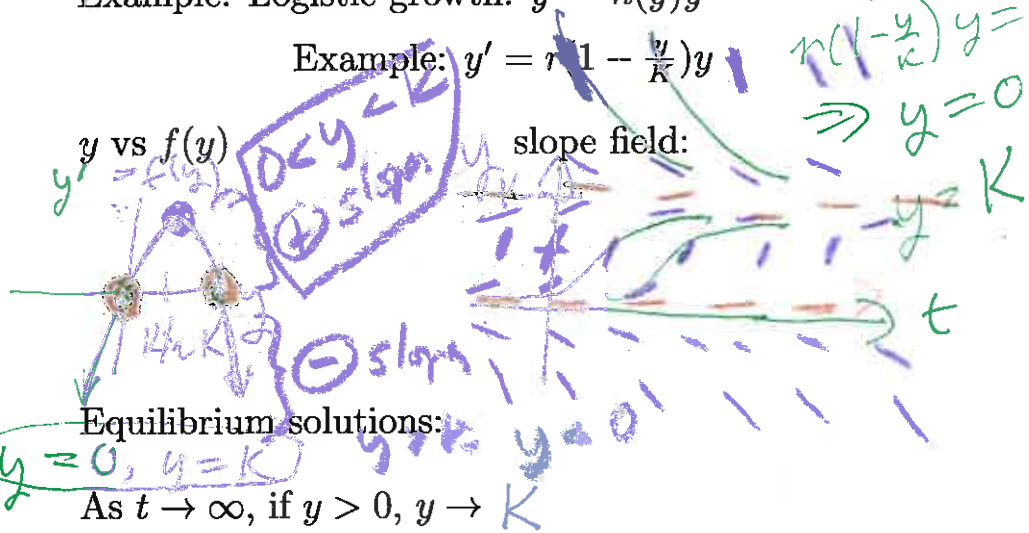
$r > 0$ 

$r < 0$ 

Example: Logistic growth: $y' = h(y)y$

Example: $y' = r(1 - \frac{y}{K})y$

y vs $f(y)$ slope field:



Equilibrium solutions:

As $t \to \infty$, if $y > 0$, $y \to K$

Solution: $y = \frac{y_0 K}{y_0 + (K - y_0)e^{-rt}}$

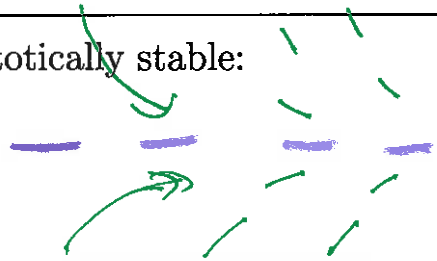
Section 2.5 Autonomous equations: $y' = f(y)$

If given either differential equation $y' = f(y)$
OR direction field:

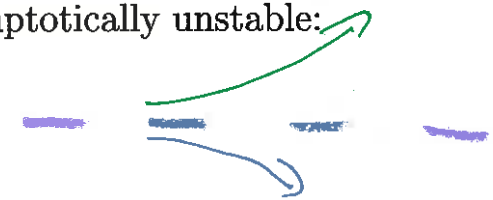
Find equilibrium solutions and determine if stable, unstable, semi-stable.

Understand what the above means.

Asymptotically stable:



Asymptotically unstable:



Asymptotically semi-stable: