Math 266 Summer 2016 Quiz 3

1) Which of the following equations is exact?

(A) $\frac{dy}{dx} = \frac{x-5y}{9-5x+2y}$ (B) $\frac{dy}{dx} = \frac{x-y}{x+2y}$

A) $M(x,y) = -x+5y$

$N(x,y) = 9-5x+2y$

$M_y = 5$ Not

$N_x = -5$ Exact

B) $M(x,y) = -x+y$

$N(x,y) = x+2y$

$M_y = 1$

$N_x = 1$ Exact

2) Find the equilibrium points of the following differential equation and classify them as stable, semistable, or unstable.

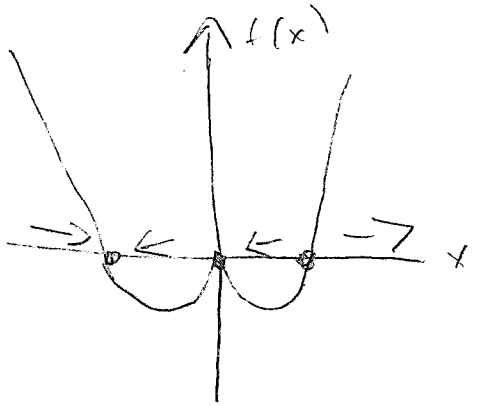
$$\frac{dx}{dt} = 2x^4 - 2x^3 - 4x^2$$

$$= 2x^2(x^2-x-2)$$

$$= 2x^2(x-2)(x+1)$$

High: 20
Low: 12
Average: 18

Equilibria are $x=0$, $x=2$, $x=-1$



Plug in, find signs

at $x=-2$, $f(-2)$ is positive

at $x=-\frac{1}{2}$, get $f(-\frac{1}{2})$ is negative

at $x=1$, get $f(1)$ is negative

at $x=3$, get $f(3)$ is positive

So,

$x=-1$, stable

$x=0$, semistable

$x=2$, unstable