Evaluate these integrals. If you use the integral table, give the number of the integral used.
(a)

 $\int \frac{x}{x^2 - 2x - 8} dx$ $\int e^{\sin(x)} \sin(x) \cos(x) dx$

(c)

(b)

$$\int \frac{1}{x\sqrt{1-(\ln(x))^2}} dx$$

2. Pictured here is the graph of $f(x) = 2x(2-x) \pmod{1}$ for $0 \le x \le 1$.



(a) On the graph, circle all fixed points and determine their stability. You need not compute derivatives to answer the stability question. Justify your answers by graphical arguments.

(b) Suppose x_a and x_b are the 2-cycle pictured in the graph. Write an equation expressing x_a as a function of x_b , and write an equation expressing x_b as a function of x_a . Do not attempt to solve these equations.

3. Consider the system

$$x' = x^3 + xy^2 - x$$
$$y' = x^2 - y^2$$

(a) Find the nullclines and sketch them. Indicate which are the x-nullclines and which are the y-nullclines.

(b) On your sketch of the nullclines, locate the fixed points of the system. Find their coordinates.

4. Consider the system

[x']		a	1]	$\begin{bmatrix} x \end{bmatrix}$
$\lfloor y' \rfloor$	=	-1	1	$\lfloor y \rfloor$

where a is a constant. Find all the values of a for which the origin is an unstable spiral. Explain how you arrived at your answer.