MATH 102-101 Quiz 5

Last name: ____________________ First name: ____________________

Student number:

0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1
2	2	2	2	2	2	2	2
3	3	3	3	3	3	3	3
4	4	4	4	4	4	4	4
5	5	5	5	5	5	5	5
6	6	6	6	6	6	6	6
7	7	7	7	7	7	7	7
8	8	8	8	8	8	8	8
9	9	9	9	9	9	9	9

Fill in your multiple-choice answers here.

Question:	Answer:				
1	a	b	c	d	e
2	a	b	c	d	e
3	a	b	c	d	e
4	a	b	c	d	e
5	a	b	c	d	e
6	a	b	c	d	e

Quiz 5

1. The differential equation $\dfrac{dy}{dt} = -3y^3 + 4y^2 - y$ has ...
   (a) ...stable steady states at $y = 0, 1/3$ and an unstable steady state at $y = 1$.
   (b) ...stable steady states at $y = 0, 1$ and an unstable steady state at $y = 1/3$.
   (c) ...a stable steady state at $y = 1/3$ and unstable steady states at $y = 0, 1$.
   (d) ...a stable steady state at $y = 1$ and unstable steady states at $y = 0, 1/3$.

2. For the same differential equation as given in question 1, the solution with initial condition $y(0) = 2/3$ asymptotes to

   (a) $-\infty$ (b) 0 (c) 1/3 (d) 1 (e) ∞

3. Which of the following is true about solutions to differential equations of the form $y' = f(y)$?
   (a) If $x(t)$ is a solution, then so is $y(t) = x(t + c)$.
   (b) If $x(t)$ is a solution, then so is $y(t) = x(t) + c$.
   (c) A solution, $y(t)$, can have a local maximum (as a function of t).
   (d) Two different solutions, $x(t)$ and $y(t)$, to the differential equation in question 1 can cross each other.

4. New words are constantly being introduced in a language. The usage of one particular new word is thought to grow according to a logistic equation $u' = 2u(1 - u) - au$ where u is the fraction of the population using the word. The usage increases at a rate proportional to the product of the fraction of people who use the word and the fraction that don't use it and decreases at a rate proportional to the number of users. The parameter a represents...
   (a) ...how appealing the word is when you first hear it.
   (b) ...how easy the word is to remember once you start using it (larger a means easier to remember).
   (c) ...how easy the word is to forget once you start using it (larger a means easier to forget).
   (d) ...how annoyed people that don't use the word get when they hear it.

5. For what values of a does the word fail to catch on and simply disappear from the language?

   (a) $a < 1$ (b) $a < 2$ (c) $a > 0$ (d) $a > 1$ (e) $a > 2$

6. When the word does catch on and spread, what is the steady state fraction of the population that uses the word?

   (a) 0 (b) $\dfrac{a}{2}$ (c) $1 - \dfrac{a}{2}$ (d) $2 - a$ (e) 1