Term Test 2

DATE: March 10, 2009
COURSE: MATH 2132

TIME: 70 minutes
EXAMINER: G.I. Moghaddam

NAME:____

STUDENT # : ____________________________

Q1	Q2	Q3	Q4	Q5	Q6	Total (out of 50)

[9] 1. Find the sum of the series $\displaystyle\sum_{n=1}^{\infty} \frac{(-1)^{n+1}\,(n+3)}{2^n}\,x^n$.

[8] 2. (a) Evaluate the following integral using infinite series

$$\int_0^1 x\, e^{-x^4}\, dx\,.$$

Express your answer in sigma notation.

(b) If you truncate the series in part (a) after the **third** term, what is a maximum possible error? Explain why you can claim that your answer is a maximum error.

[8] 3. Find a 1 -parameter family of solutions for differential equation

$$xy + x - y - 1 - y\,\frac{dy}{dx} = 0.$$

Is there any singular solution? Explain.

[8] 4. Find a 2 -parameter families of solutions for differential equation

$$(y^{'})^{\frac{3}{2}}\,y^{''} = 4x\,(y^{'})^{2}.$$

[8] 5. Newton's second law of motion says that an object of mass m falling near the surface of the earth is retarded by air resistance proportional to its velocity i.e. $m\dfrac{dv}{dt} = mg - kv$, where $v = v(t)$ is the velocity of the object at time t and g is the gravitational constant and k is constant of proportionality.
If an object of mass 1 kilogram is dropped (with no initial velocity) from a hovering helicopter, such that the air resistance is proportional to the velocity of the object; then:

(a) Create and solve an initial-value problem to find the velocity of the object as a function of time t.

(b) What is your prediction about the velocity in long run, i.e. $\lim\limits_{t\to\infty} v(t)$?

[9] 6. Find the general solution for the homogeneous linear differential equation :

$$y^{(8)} + 4\,y^{(6)} + 4\,y^{(4)} = 0$$