ENTRY QUIZ FOR M3150, FALL 2012
DUE DAY: M, AUGUST 27

SIGN YOUR NAME:

This quiz lists topics in the prerequisite courses M1220 and M2250 or equivalent that are critical for understanding the material of this course M3150. Solve the problems and read the textbooks if you meet difficulties.

1. INTEGRATION

Evaluate the integrals, review the method of evaluation

(1)
$$\int_a^b \cos(c\,x)\ dx, \quad \int_{-\pi}^{\pi} \sin(n\,x)\ dx, \quad n \text{ is an integer}$$

(2)
$$\int_a^b \cos^2(c\,x)\ dx, \quad \int_{-\pi}^{\pi} \sin^2(n\,x)\ dx, \quad n \text{ is an integer}$$

(3)
$$\int_a^b \cos(c\,x)\,\cos(d\,x)\ dx \quad \int_a^b \sin(c\,x)\,\cos(d\,x)\ dx$$

(4)
$$\int_{-\pi}^{\pi} \sin(n\,x)\sin(m\,x)\ dx, \quad n, m \text{ are integers. Consider cases } n = m, n \neq m$$

(5)
$$\int_{-\pi}^{\pi} \sin(n\,x)\cos(m\,x)\ dx, \quad n, m \text{ are integers}$$

(6)
$$\int_a^b x\,\cos(c\,x)\ dx, \quad \int_a^b x^2\,\cos(c\,x)\ dx, \quad \int_a^b e^x \sin(c\,x)\ dx$$

2. LINEAR ALGEBRA

Define parameter a so that vectors p and q are orthogonal,

(7)
$$p = (1,\ 2), \quad q = (a, -1).$$

For a symmetric matrix A,

(8)
$$A = \begin{pmatrix} 2 & 1 \\ 1 & 2 \end{pmatrix},$$

a) find the eigenvectors and show that they form an *orthogonal basis*,
b) represent vector $(2,3)$ in that basis.

3. DIFFERENTIAL EQUATIONS

Solve the equations (find a general solution):

$$
(9) \qquad\qquad\qquad \frac{du}{dx} + cu = 0,
$$

$$
(10) \qquad \frac{d^2u}{dx^2} + c^2 u = 0, \qquad \frac{d^2u}{dx^2} - c^2 u = 0,
$$

Find all solutions of the second-order differential equation with one initial condition.

$$
(11) \qquad\qquad \frac{d^2u}{dx^2} + c^2 u = 0, \qquad u(0) = 0.
$$

Sketch the graph of that family.