PHYS 373 (Spring 2015): Mathematical Methods for Physics II
2\textsuperscript{nd} Mid-term exam: Thursday, April 23, 2.00 pm.-3.15 pm.

Read the instructions below and do not flip to next page till you are told to do so.

Name: 
Student ID: 

**Useful formulae:**

\[ f(x) = \frac{a_0}{2} + \sum_{n=1}^{\infty} \left( a_n \cos \frac{n\pi x}{l} + b_n \sin \frac{n\pi x}{l} \right) \]

\[ P^m_l(x) = (1 - x^2)^{m/2} \frac{d^m}{dx^m} P_l(x) \]

\[ \int_0^1 x J_p(\alpha x) J_p(\beta x) = 0 \quad (\alpha \neq \beta) \]

\[ c_m = \frac{2m+1}{2} \int_1^1 f(x) P_m(x) dx \]

\[ f(z) = f(x + iy) = u(x, y) + iv(x, y) \]

\[ \frac{d}{dx} \left[ x^{-p} J_p(x) \right] = -x^{-p} J_{p+1}(x) \]

\[ \frac{\partial^2}{\partial x^2} T(x, y) + \frac{\partial^2}{\partial y^2} T(x, y) = 0 \]

\[ T = \left\{ e^{kx} \right\} \left\{ \begin{array}{c} \sin ky \\ \cos ky \end{array} \right\} \quad \text{or} \quad \left\{ \begin{array}{c} \sin kx \\ \cos kx \end{array} \right\} \left\{ e^{ky} \right\} \]

It is necessary to show the details of the derivation and not just the final answer for all problems.

This is a closed book exam: crib sheets are not allowed.

In case they are needed, more blank paper and staples are provided.

Please write clearly and if you use the backside of a page, then please indicate so.

Check that there are total of 5 pages (4 problems).

Remember the honor pledge that you signed at the start of the semester.

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