Physics 3513, Homework #9 (due 11/29)

The numbers in parentheses after the problem number indicate points for each problem.

P1(10) (Boas 1.21) Find the real and imaginary parts \( u(x, y) \) and \( v(x, y) \) of \( f(z) = e^{iz} \)

P2(10) (Boas 3.2a) Evaluate \( \int_{0}^{1+i} (z^2 - z) \, dz \) along the line \( y = x \)

P3(20) (Boas 4.5) Find the first few terms of each of the Laurent series about the origin (one series for each annular ring between singular points), and calculate \( \text{Res}_{z=0} f(z) \) for
\[
f(z) = \frac{z - 1}{z^3(z - 2)}
\]

P4(10) (Boas 6.6) By finding the Laurent series, calculate \( \text{Res}_{z=0} \sin \frac{1}{z} \)

P5(10) (Boas 6.24) Find \( \text{Res}_{z=0} \frac{1 - \cos 2z}{z^3} \)

P6(20) (Boas 7.4) Evaluate \( \int_{0}^{2\pi} \frac{\sin^2 \theta \, d\theta}{5 + 3 \cos \theta} \)

P7(20) (Boas 7.30a) Evaluate \( \int_{0}^{\infty} \frac{dx}{1 + x^4} \)