# Departamento de Matemáticas

Facultad de Ciencias Naturales
Recinto de Río Piedras

**MATE 3152**

Apellidos: _____ _____ Nombre: _____
No. de estudiante: _____ Profesor: _____
Examen IR 13 de abril de 2011 # de sección: _____

**Para obtener crédito muestre todo su trabajo. Explique claramente su contestación.**

(1) (6 pts.) Find the derivative $f'(x)$ if $f(x) = (x^2+1)^{x^3}$.

(2) (6 pts.) Find the following limit if it exists: $\lim_{x\to\frac{\pi}{6}} \left(\frac{\tan(2x)-\sqrt{3}}{x-\frac{\pi}{6}}\right)^4$

(3) (6 pts.) Compute $\int \frac{dx}{x^2 - 2x + 2}$

(4) (6 pts.) Compute $\int \frac{dx}{\sqrt{-x^2 + 2x}}$

(5) (10 pts.) Use integration by parts to compute $\int e^{(9x)} \sin(x) dx$

(6) (8 pts.) Solve the differential equation: $y' + 9y = 82 \sin x$ with $y(\pi) = 0$.

(7) (6 pts.) Find and simplify: $f'(x)$ if $f(x) = \sin^{-1}[\cos x]$.

(8) (6 pts.) Compute $\int \sin x \cos x \cosh(\cos(2x))dx$

(9) (6 pts.) Compute $\int y\sqrt{y+1}dy$

(10) (6 pts.) Use integration by parts to compute: $\int x^5 \ln(x) dx$

(11) (6 pts.) Does the integral $\int_0^{\frac{1}{2}} \tan^2(\pi x) dx$ converge? Justify your answer.

(12) (8 pts.) Compute $\int \sqrt{x^2 - 16}\, dx$

(13) (8 pts.) Obtain the partial fraction decompositions of $\dfrac{x^2 + 4x}{x^3 - 8}$

(14) (6 pts.) Evaluate the integral $\int \frac{x^2+4x}{x^3-8}\,dx$.

(15) (6 pts.) Does the integral: $\int_0^2 \frac{x^2+4}{x^3-8}\,dx$ converge? Justify your answer.

(16) (6 pts) Find the limit: $\lim_{x\to 0} \frac{x\sin(x^2)}{x^3-\sin^3 x}$