Review Exam II

1. Integrate the following

$$\int \sec^4(3x)\tan^2(3x)\,dx \qquad \int \sin^3 2x\,dx$$

$$\int \frac{dx}{(9+4x^2)^{3/2}}\,dx \qquad \int \frac{x-3}{\sqrt{4-x^2}}\,dx$$

$$\int x\cos(3x)\,dx \qquad \int x^3\ln(x)\,dx$$

$$\int \frac{1}{x^2-x}\,dx \qquad \int \frac{x^3+4}{x^2-4}\,dx$$

$$\int \frac{x^2}{\sqrt{x-1}}\,dx \qquad \int x\sqrt{9+x^2}\,dx$$

$$\int \frac{x^5}{\sqrt{1-x^3}}\,dx \qquad \int \tan x\,dx$$

2. Tell wether the integral converges or diverges. If it converges, give the limit. If it diverges, show why.

$$\int_1^9 \frac{1}{\sqrt[3]{x-9}}\,dx \qquad \int_1^\infty \frac{\ln x}{x}\,dx$$

$$\int_0^\infty xe^{-2x}\,dx \qquad \int_1^3 \frac{1}{(x-3)^2}\,dx$$

3. Solve the following differential equations

$y' = xe^y, \qquad y(2) = 0$ $\qquad\qquad$ $x\,dx + 2y\sqrt{x^2+1}\,dy = 0, \qquad y(0) = 1$

4. A tank initially contains 60 gallons of brine in which 15 lb of salt is dissolved. Brine containing 0.5 lb of salt per gallon flows into the tank at a constant rate of 6 gal/min. The concentration of brine and salt in the tank is kept uniform by stirring, and the brine is drawn off at a rate of 3 gal/min. Find the amount of salt in the tank after 10 min.

5. Integration Bee is March 21. To sign up now, e-mail Dr Rubin at rubin@math.pitt.edu