

Exam II

Name \_\_\_\_\_

1. Integrate the following

(a)  $\int \sin^3(2x) \cos^3(2x) dx$

(b)  $\int \frac{dx}{(9 - 4x^2)^{3/2}}$

(c)  $\int \frac{3x + 2}{\sqrt{x + 1}} dx$

$$(d) \int \frac{x^4 - 3x^2 - 1}{x^2 - 1} dx$$

$$(e) \int 4xe^{-3x} dx$$

$$(f) \int \tan^{-1} x dx$$

$$(g) \int e^{2x} \sqrt{9 - e^{2x}} dx$$

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

(a)  $\int_3^{\infty} \frac{1}{\sqrt{x-2}} dx$

(b)  $\int_0^{\infty} \frac{4}{(1+x)^2} dx$

3. Solve the following differential equation for  $y(x)$ .

$$y dx - 2x^2 dy, \quad y(1) = \frac{5}{\sqrt{e}}$$

4. A tank initially contains 100 gallons of brine in which 2 lb of salt is dissolved. Brine containing 0.2 lb of salt per gallon flows into the tank at a constant rate of 5 gal/min. The concentration of brine and salt in the tank is kept uniform by stirring, and the mixture is drawn off at a rate of 5 gal/min. Write and solve a differential equation to find the amount of salt in the tank after 60 min.

Integration Bee is March 21. To sign up now, e-mail Dr Rubin at [rubin@math.pitt.edu](mailto:rubin@math.pitt.edu)