INSTRUCTIONS: Answer all 8 problems. Show your work: even correct answers may receive little or no credit if a method of solution is not shown. Remember to express all answers in terms of the original variable of the problem. Simply expressions involving the composition of trig and inverse trig functions (e.g. $\tan\left(\cos^{-1}\left(\frac{x}{2}\right)\right) = \frac{\sqrt{4-x^2}}{x}$) Calculators, notes, cell phones, and other materials are not permitted.

$$\sin^2 u = \frac{1}{2}(1 - \cos 2u) \qquad \cos^2 u = \frac{1}{2}(1 + \cos 2u) \qquad \sin 2u = 2\sin u \cos u$$

$$\int \tan u \, du = \ln|\sec u| + C \quad \int \sec u \, du = \ln|\sec u + \tan u| + C \quad \int \frac{1}{u^2 + a^2} \, du = \frac{1}{a}\tan^{-1}\left(\frac{u}{a}\right) + C$$

1. Evaluate the integral: $\displaystyle\int_0^3 t e^{\frac{t}{3}} \, dt$

2. Evaluate the integral: $\displaystyle\int \frac{x}{x-5}\,dx$

3. Evaluate the integral: $\displaystyle\int \sec^4\theta\,d\theta$

4. Evaluate the integral: $\displaystyle \int \frac{2}{(x-4)(x-2)}\,dx$

5. Evaluate the integral: $\displaystyle\int \frac{x^3}{\sqrt{4-x^2}}\, dx$

6. Use the comparison test to determine if the integral converges or diverges: $\displaystyle\int_1^\infty \frac{1}{xe^x}\,dx$

7. Use the comparison test to determine if the integral converges or diverges: $\displaystyle\int_2^\infty \frac{1}{\sqrt{x^2-1}}\,dx$

8. Evaluate the integral or show that it diverges: $\displaystyle\int_0^2 \frac{1}{(1-x)^2}\,dx$