Calculus Final Jan, 8, 2008

NO electronic or mechanical devices which have calculating or programming function are allowed. The act of using such a device is treated as cheating.

Evaluate the integral.

1. (10 %) $\int (\ln x)^2 \, dx$
2. (10 %) $\int e^{2x} \, \sin 3x \, dx$
3. (10 %) $\int_{\frac{\pi}{2}}^{\frac{3\pi}{4}} \sin^5 x \, \cos^3 x \, dx$
4. (10 %) $\int \tan^3 x \, \sec x \, dx$
5. (10 %) $\int \sec^3 x \, dx$
6. (10 %) $\int \frac{x}{\sqrt{3-2x-x^2}} \, dx$
7. (10 %) $\int \frac{x^4-2x^2+4x+1}{x^3-x^2-x+1} \, dx$
8. (10 %) $\int \frac{x+4}{x^2+2x+5} \, dx$
9. (10 %)
   (a) Show that $\int_{-\infty}^{\infty} x \, dx$ is divergent.
   (b) Show that
   $$\lim_{t\to\infty} \int_{-t}^{t} x \, dx = 0$$
10. (10 %) The ellipse
    $$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1 \qquad a > b$$
    is rotated about the x-axis to form a surface called an ellipsoid. Find the surface area of this ellipsoid.

God Bless You!