Homework 5: Improper Integrals (due February 13)

1. Compute $\displaystyle\int_0^\infty xe^{-x}\,dx$ (Hint: Integrate by parts)

2. Compute $\displaystyle\int_0^3 \frac{y}{\sqrt{9-y^2}}\,dy$ (Hint: Make a substitution)

3. Compute $\displaystyle\int_0^2 \frac{1}{\sqrt{4-x^2}}\,dx$. (Hint: Start by letting $x = 2\sin(\theta)$ or you can use a table)

4. Compute $\displaystyle\int_{-\infty}^\infty \frac{1}{z^2+25}\,dz$ (Hint: Start by letting $z = 5\tan(\theta)$ or you can use a table)

5. Given that $\displaystyle\int_{-\infty}^\infty e^{-x^2}\,dx = \sqrt{\pi}$, use a substitution to compute the exact value of

$$\int_{-\infty}^\infty e^{-\frac{(x-a)^2}{b}}\,dx$$