College of the Holy Cross, Spring Semester, 2019
Math 134 Worksheet 8
Due Tuesday, February 26

1. Let R be the region enclosed by the parabolas $y = x^2 + 1$ and $y = 3 - x^2$.
   (a) Find the area of R.
   (b) Find the volume of the solid obtained by revolving R around the x-axis.
   (c) Find the volume of the solid obtained by revolving R around the line $y = -2$.

2. Use integration by parts to evaluate the following integrals.
   (a) $\int x^2 e^{7x}\,dx$
   (b) $\int \sqrt{x}\ln(x)\,dx$
   (c) $\int x^2 \sin^{-1}(x)\,dx$
   (d) $\int e^x \cos(2x)\,dx$
   (e) $\int e^{\sqrt{x}}\,dx$
   (f) $\int (\ln(x))^2\,dx$

3. Use integration by parts to derive the following reduction formula:
$$\int \cos^n(x)\,dx = \frac{1}{n}\cos^{n-1}(x)\sin(x) + \frac{n-1}{n}\int \cos^{n-2}(x)\,dx$$

4. Use the reduction formula above to evaluate $\int \cos^n(x)\,dx$ for $n = 2$, 3, 4, and 5.

5. Use the formula
$$\int \sec^n u\,du = \frac{1}{n-1}\tan u \sec^{n-2} u + \frac{n-2}{n-1}\int \sec^{n-2} u\,du$$
   to evaluate $\int \sec^n(x)$ for $n = 4$ and $n = 6$.

6. Use the formula
$$\int \tan^n u\,du = \frac{1}{n-1}\tan^{n-1} u - \int \tan^{n-2} u\,du$$
   to evaluate $\int \tan^n(x)$ for $n = 3$ and $n = 4$.