GROUP WORK 2, SECTION 3.9
Antidifferentiation Formulas

In your textbook there is a table of antidifferentiation formulas. For example, one antiderivative of $\frac{1}{1+x^2}$ is $\tan^{-1} x$, because $\left(\tan^{-1} x\right)' = \frac{1}{1+x^2}$. (A different antiderivative of $\frac{1}{1+x^2}$ is $\tan^{-1} x + 5$. Do you see why?)

Even though you don't have a systematic method for finding antiderivatives, you can use your knowledge of differentiation, along with your inherent cleverness, to find some antidifferentiation formulas by yourself. Try to find antiderivatives of the functions below. (You can always check your work by differentiating your answer.)

1. An antiderivative of $\cos x$ is:

2. An antiderivative of $5 \cos x$ is:

3. An antiderivative of $\cos(5x)$ is:

4. An antiderivative of $x^2 \cos\left(x^3\right)$ is:

5. An antiderivative of $3x^2 \sin x + x^3 \cos x$ is:

6. An antiderivative of $\frac{3x^2 \sin x - x^3 \cos x}{\sin^2 x}$ is:

GROUP WORK 3, SECTION 3.9

A Strange Antiderivative

We want to find an antiderivative F for $f(x) = |x + 2|$ satisfying $F(-1) = 0$.

1. Draw a graph of f.

2. Write f in terms of two formulas, one for $x < -2$ and the other for $x \geq -2$.

3. Compute general antiderivatives for each of the formulas written in part (b).

4. Using the condition $F(-1) = 0$, compute the constant in the antiderivative formula for $x \geq -2$.

5. Remembering that F must be continuous at $x = -2$, find the antiderivative formula for all x by computing the constant for $x < -2$.

6. Graph the antiderivative F on the same graph as f. Is it differentiable everywhere?