

LESSON 5: Cross Referencing Equations, Name: _____

As you now know math mode can be turned on and off several different ways. The *in-text* math mode can be turned on and off using $\$$ and *displayed mode* can be turned on and off by $\$\$$ or $\[\]$. But both of sometimes we want displayed equations with equation numbers so we can refer to them later in a paper. The simplest way to do this for a one line equation is with the *equation* environment.

Consider the second order polynomial equation

```
\begin{equation}
ax^2+bx+c=0. \label{eq1}
\end{equation}
```

The equation ($\ref{eq1}$) is called a quadratic equation. The solution to $\eqref{eq1}$ is given by

```
\begin{equation}\label{eq2}
x=\frac{-b \pm \sqrt{b^2-4ac}}{2a}
\end{equation}
```

and equation $\eqref{eq2}$ is called the quadratic formula.

Consider the second order polynomial equation

$$ax^2 + bx + c = 0. \quad (1)$$

The equation (1) is called a quadratic equation. The solution to (1) is given by

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \quad (2)$$

and equation (2) is called the quadratic formula.

Note that there are two ways to refer to an equation \ref which does not put parentheses around the number and \eqref which does put parentheses around the number but is only available if you use the *amsmath* package. If you did not want to use the *amsmath* package but you wanted a way to get parentheses around a reference number with having to type them you could put a statement like $\newcommand\eref[1]{(\ref{#1})}$ (which I did in this file). Now lets reset the equation counter to zero

```
\setcounter{equation}{0}
```

Sometimes you would like to have *subequations* with counters like (1a) and (1b), etc. This is done with the *subequations* environment.

```
\begin{subequations}
\begin{equation} \label{int1}
\int_0^\pi \cos(x) dx = \sin(x) \big|_0^\pi = 0,
\end{equation}
\begin{equation} \label{int1}
\int_0^\pi \sin(x) dx = -\cos(x) \big|_0^\pi = 0.
\end{equation}
\end{subequations}
```

produces

$$\int_0^\pi \cos(x) dx = \sin(x) \Big|_0^\pi = 0, \quad (1a)$$

$$\int_0^\pi \sin(x) dx = -\cos(x) \Big|_0^\pi = 0. \quad (1b)$$

To make the numbering given in *roman numerals*, for example, we can issue a command like

```
\renewcommand{\theequation}{\roman{equation}}
```

which allows us to get

$$x^2 + y^2 = z^2 \quad (II)$$

The choices that I know are *Alph*, *alph*, *Roman*, *roman*, *arabic*.

PROBLEM: Write \LaTeX commands and words to display the expression

$$x^2 - y^2 = (x + y)(x - y),$$

give it an equation number and then write some text referring to the equation (e.g., Equation (blah) is the difference of two squares formula).