MA 630 - LaTeX Typesetting Test

Complete each of the typesetting exercises below. You may use any (course or external) resources that you like, but please complete the assignment *on your own.*

0. Complete Part 1 of the LaTeX tutorial available at Overleaf.
1. Typeset each of the following expressions below.
   - Your name: Adam Frank
   - The letter z as a mathematical variable: z
   - The lower-case Greek letter gamma: γ
   - The upper-case Greek letter Gamma: Γ
   - The integral of the sine of x with respect to x: $\int \sin x \; dx$
   - The fraction 67 over 92: $\frac{67}{92}$
   - The set containing the numbers 1, 2, and 3: $\{1, 2, 3\}$
   - The square root of the quantity 7 minus the natural log of t: $\sqrt{7 - \ln t}$
2. The symbols `\[...\]` may be used in place of `\begin{equation*} ... \end{equation*}` for a single line of displayed mathematics (provided the `amsmath` package is loaded as in this document). Type the quadratic formula (i.e. the formula which gives the solution(s) to the equation $ax^2 + bx + c = 0$) below:

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

3. Typeset the sentence from the image at https://imgur.com/a/TSp6KBX below. Be sure that all mathematical symbols are in math mode.

   Also, $a_B(\hat{K}) = 0$ if K does not consist of p-regular elementsw (Corollary (3.8)), and for every p-regular element x_K, we have that

$$f_B(\hat{K}) = \frac{1}{|G|} \sum_{\chi \in \mathrm{Irr}(B)} \chi(1)\chi(x_K^{-1}) = \frac{1}{|G|} \sum_{\varphi \in \mathrm{IBr}(B)} \Phi_\varphi(1)\varphi(x_K^{-1}),$$

   (setting $\mathcal{A} = \mathrm{Irr}(B)$ in Theorem (3.6))

4. Compute the derivative of $\dfrac{x^3+x}{2x+1}$ (and show all steps) with respect to x. Use the `align*` environment to place each step of the solution on a new line, aligning each new line on the equals sign. Leave your answer as a quotient of unfactored polynomials.

$$\begin{aligned}
\frac{d}{dx}\left[\frac{x^3+x}{2x+1}\right] &= \frac{(2x+1)\frac{d}{dx}(x^3+x)-(x^3+x)\frac{d}{dx}(2x+1)}{(2x+1)^2} \\
&= \frac{(2x+1)(3x^2+1)-(x^3+x)(2)}{(2x+1)^2} \\
&= \frac{6x^3+2x+3x^2+1-(2x^3+2x)}{(2x+1)^2} \\
&= \frac{4x^3+3x^2+1}{(2x+1)^2} \\
&= \frac{4x^3+3x^2+1}{4x^2+4x+1}
\end{aligned}$$

5. Fill in the missing parts in the proof of the following result below (replace the `\cdots`s).
For the definition of *odd* and a similar, sample proof, see the Section 1.4 Notes.
Theorem. The product of two odd integers is odd.
Proof. Let x and y be odd integers. Then $x = 2m+1$ and $y = 2n+1$ for some integers m and n. Thus,

$$xy = (2m+1)(2n+1) = 4mn+2m+2n+1 = 2(2mn+m+n)+1,$$

and therefore there is an integer t, namely $t = 2mn+m+n$ such that $xy = 2t+1$. Thus, by definition, xy is odd. $\square$