

LaTeX Samples

This document contains many examples of various TeX commands. The examples were not coded in the shortest or most efficient manner. Instead, they were coded in the simplest manner for a person beginning in TeX to follow – a starting point.

Diagram 1:



Diagram 2:

$$\underbrace{M_i \xrightarrow{k_i} M \xrightarrow{\pi_j} M_j}_{f_{ji} \stackrel{\text{def}}{=} \pi_j f k_i}$$

Diagram 3:

$$\mathbb{Z} \xrightarrow{r} \mathbb{Q} \begin{array}{c} \xrightarrow{g_1} \\ \xrightarrow{g_2} \end{array} A$$

Diagram 4:

$$0 \longrightarrow A \xrightarrow{f} B \xrightarrow{g} C \longrightarrow 0$$

Diagram 5:

$$\dots \longrightarrow P^{n+1} \xrightarrow{d^{n+1}} P^n \xrightarrow{d^n} \dots \xrightarrow{d^2} P^1 \xrightarrow{d^1} P^0 \xrightarrow{d^0} M \longrightarrow 0$$

Diagram 6:

$$\dots \longrightarrow \underbrace{0}_{\text{3-dimensional}} \longrightarrow \underbrace{0}_{\text{2-dimensional}} \xrightarrow{\partial_2} \underbrace{\mathbb{Z}u \oplus \mathbb{Z}v \oplus \mathbb{Z}w}_{\text{1-dimensional}} \xrightarrow{\partial_1} \underbrace{\mathbb{Z}a \oplus \mathbb{Z}b \oplus \mathbb{Z}c}_{\text{0-dimensional}} \xrightarrow{\partial_0} \underbrace{0}_{\text{(-1)-dimensional}}$$

Diagram 7:

$$\begin{array}{ccccccc} & & & M & & & \\ & & & \downarrow h & & & \\ 0 & \longrightarrow & A & \xrightarrow{k} & B & \xrightarrow{g} & C \longrightarrow 0 \\ & & \nearrow s & \searrow f & & & \end{array}$$

Diagram 8:

$$\begin{array}{ccccccc} 0 & \longrightarrow & A & \xrightarrow{f} & B & \xrightarrow{g} & C \longrightarrow 0 \\ & & \downarrow \alpha & & \downarrow \beta & & \downarrow \gamma \\ 0 & \longrightarrow & A' & \xrightarrow{f'} & B' & \xrightarrow{g'} & C' \longrightarrow 0 \end{array}$$

Diagram 9:

$$\begin{array}{ccccccc} 0 & \longrightarrow & A & \longrightarrow & B & \longrightarrow & C \longrightarrow 0 \\ & & \uparrow f^{-1} \downarrow f & & \uparrow g^{-1} \downarrow g & & \uparrow h^{-1} \downarrow h \\ 0 & \longrightarrow & A' & \longrightarrow & B' & \longrightarrow & C \longrightarrow 0 \end{array}$$

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Diagram 10:

$$\begin{array}{ccccccc}
 A & \xrightarrow{f} & B & \xrightarrow{g} & C & \longrightarrow & 0 \\
 \downarrow \alpha & & \downarrow \beta & & \downarrow h & & \\
 A' & \xrightarrow{f'} & B' & \xrightarrow{g'} & C' & \longrightarrow & 0
 \end{array}$$

Diagram 11:

$$\begin{array}{ccccccc}
 V_i & \xrightarrow{f_{a_1}} & V_{i_1} & \xrightarrow{f_{a_2}} & \cdots & \xrightarrow{f_{a_{\varphi-1}}} & V_{i_{\varphi-1}} & \xrightarrow{f_{a_\varphi}} & V_\varphi \\
 \downarrow h_i & & \downarrow h_{i_1} & & & & \downarrow h_{i_{\varphi-1}} & & \downarrow h_\varphi \\
 W_i & \longrightarrow & W_{i_1} & \longrightarrow & \cdots & \longrightarrow & W_{i_{\varphi-1}} & \longrightarrow & W_\varphi
 \end{array}$$

Diagram 12:

$$\begin{array}{ccccccc}
 0 & \longrightarrow & S_1 & & S_1 \oplus \cdots \oplus S_n & \longrightarrow & S_2 \oplus \cdots \oplus S_n & \longrightarrow & 0 \\
 & & \downarrow \sim & & \downarrow \sim & & \downarrow \exists! & & \\
 0 & \longrightarrow & T_1 & & T_1 \oplus \cdots \oplus T_n & \longrightarrow & T_2 \oplus \cdots \oplus T_s & \longrightarrow & 0
 \end{array}$$

Diagram 13:

$$\begin{array}{ccccccc}
 \xi : & 0 & \longrightarrow & A & \longrightarrow & X_n & \longrightarrow & \cdots & \longrightarrow & X_1 & \longrightarrow & C & \longrightarrow & 0 \\
 & & & \downarrow = & & \downarrow \alpha_n & & & & \downarrow \alpha_1 & & \downarrow = & & \\
 \xi' : & 0 & \longrightarrow & A & \longrightarrow & X'_n & \longrightarrow & \cdots & \longrightarrow & X'_1 & \longrightarrow & C & \longrightarrow & 0
 \end{array}$$

Diagram 14:

$$\begin{array}{ccc}
 B & \xrightarrow{\varphi} & P \\
 \searrow \varphi_i & & \swarrow \pi_i \\
 & A_i &
 \end{array}$$

Diagram 15:

$$\begin{array}{ccccc}
 & & P & & \\
 & \swarrow \pi_1 & \downarrow \varphi & \searrow \pi_2 & \\
 A_1 & \xleftarrow{\varphi_1} & B & \xrightarrow{\varphi_2} & A_2
 \end{array}$$

Diagram 16:

$$\begin{array}{ccc}
 A_i & \xrightarrow{\varphi_i} & B \\
 \searrow \tau_i & & \uparrow \varphi \\
 & A_1 \times A_2 \times \cdots \supset S &
 \end{array}$$

Diagram 17:

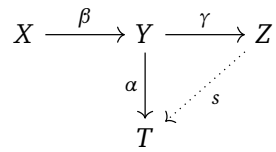


Diagram 19:

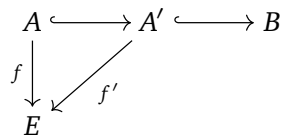


Diagram 20:

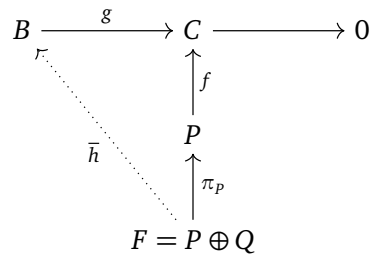


Diagram 21:

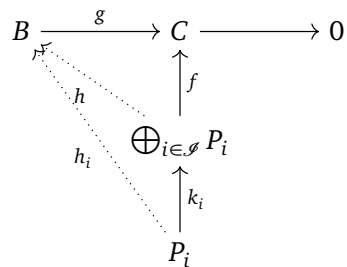
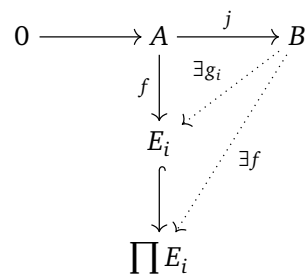


Diagram 22:



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Diagram 23:

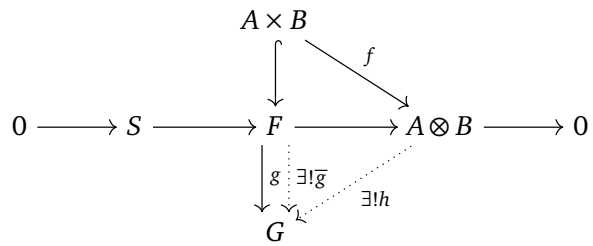


Diagram 24:

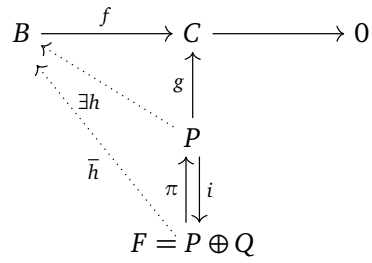


Diagram 25:

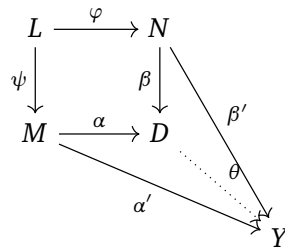


Diagram 26:

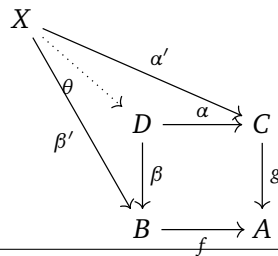


Diagram 27:

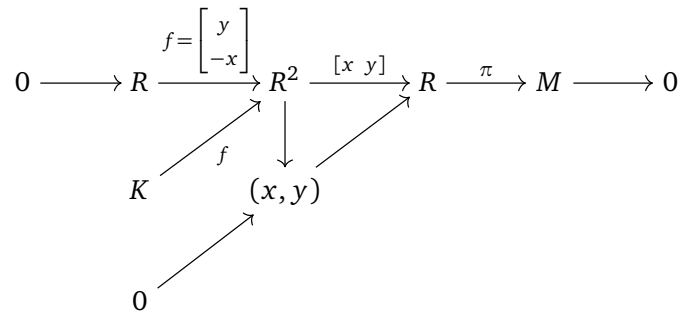


Diagram 28:

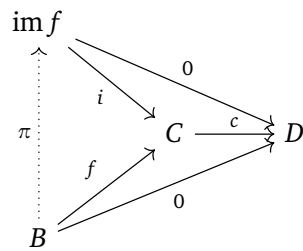


Diagram 29:

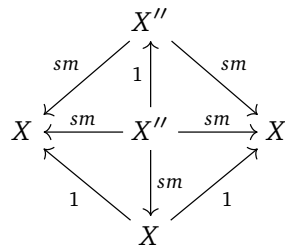


Diagram 30:

$$V_i \oplus W_i \xrightarrow{\begin{bmatrix} f_\alpha & 0 \\ 0 & g_\alpha \end{bmatrix}} V_j \oplus W_j$$

Diagram 31:

$$\begin{array}{ccc}
 V_1 \oplus W_1 & & V_2 \oplus W_2 \\
 \searrow & & \swarrow \\
 \begin{bmatrix} f_1 & 0 \\ 0 & g_1 \end{bmatrix} & \longrightarrow & V \oplus W & \longleftarrow & \begin{bmatrix} f_2 & 0 \\ 0 & g_2 \end{bmatrix}
 \end{array}$$

Diagram 32:

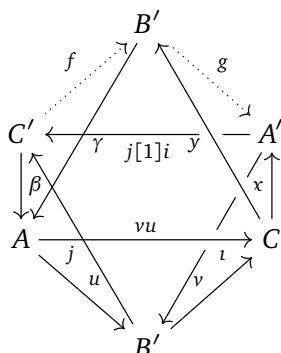


Diagram 33:

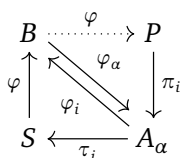


Diagram 34:

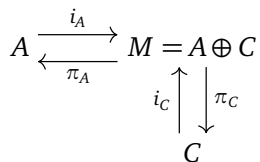


Diagram 35:

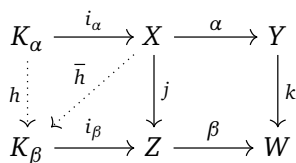


Diagram 36:

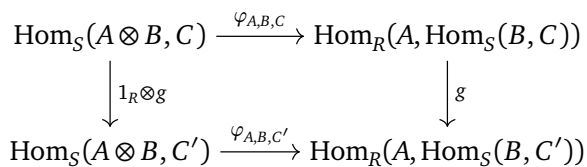


Diagram 37:

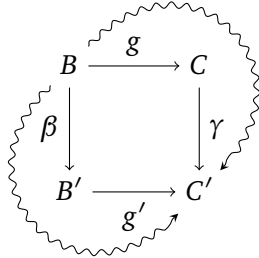


Diagram 38:

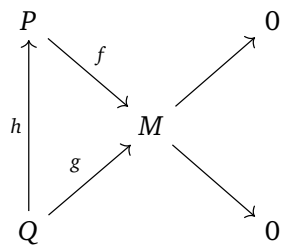


Diagram 39:



Diagram 40:

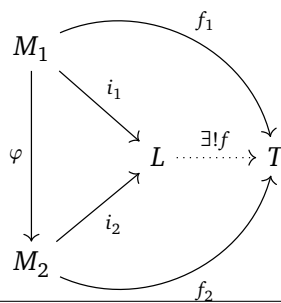


Diagram 41:

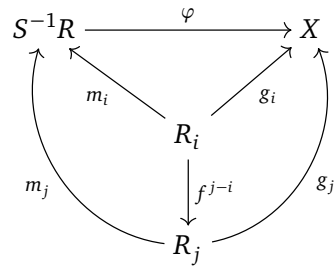


Diagram 42:

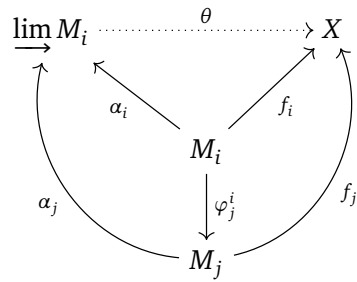


Diagram 43:

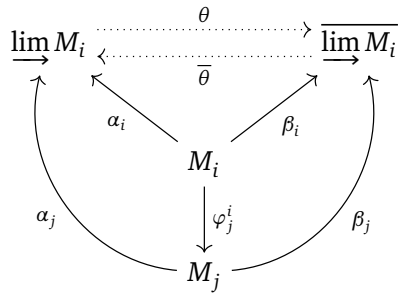


Diagram 44:

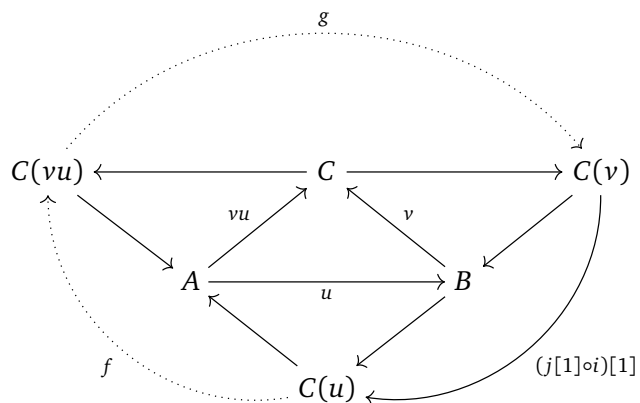


Diagram 45:

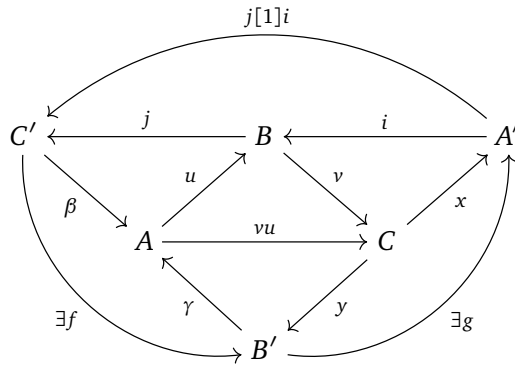


Diagram 46:

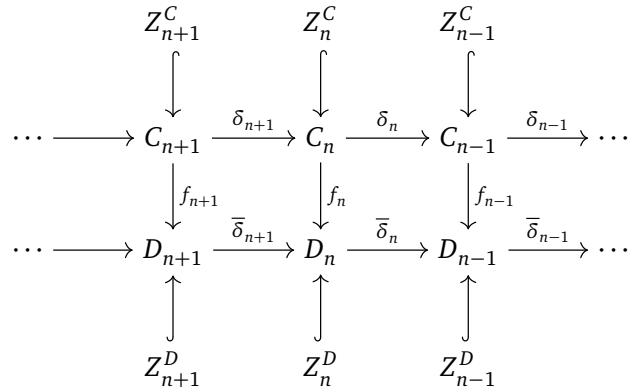


Diagram 47:

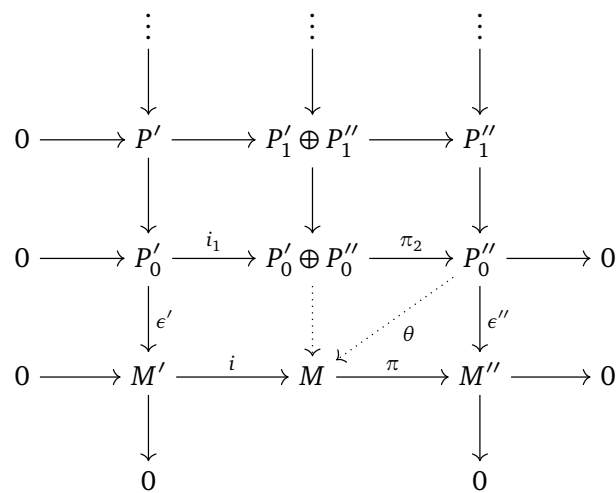


Diagram 48:

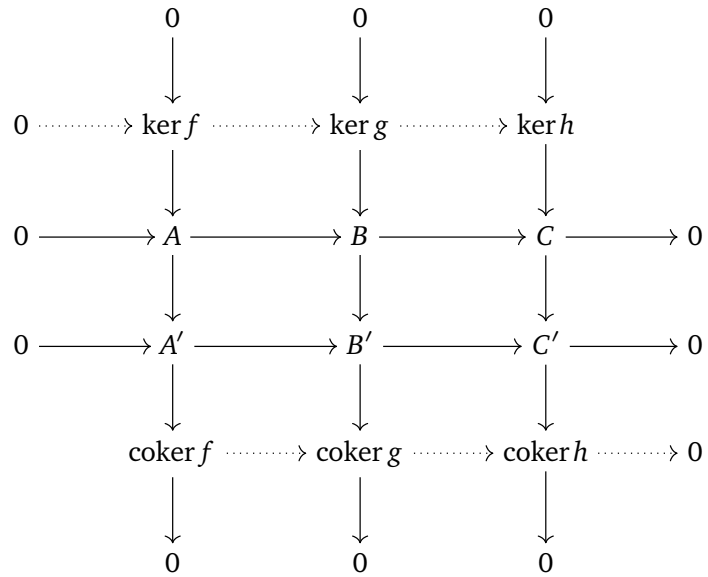


Diagram 49:

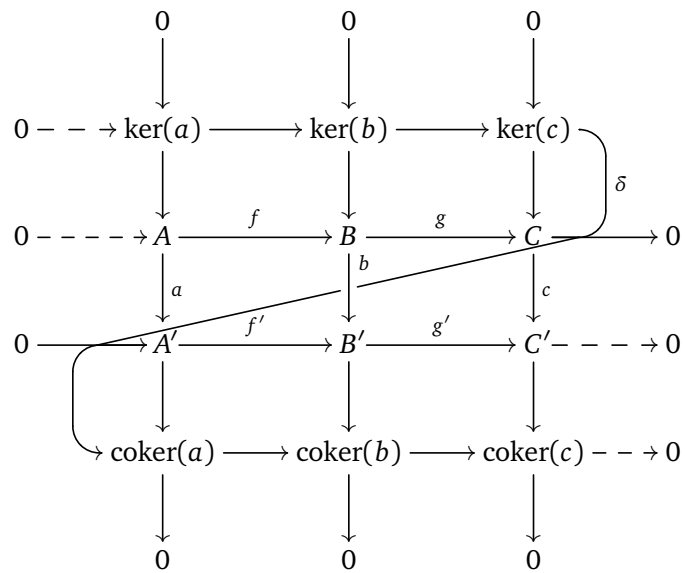


Diagram 50:

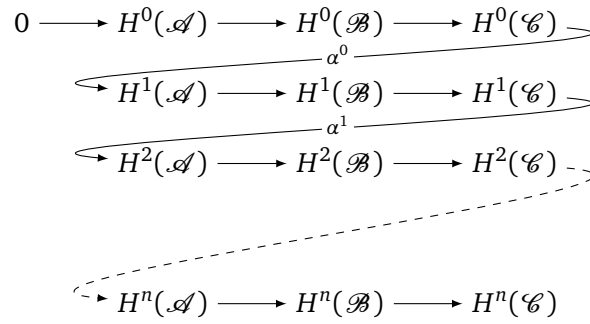


Diagram 51:

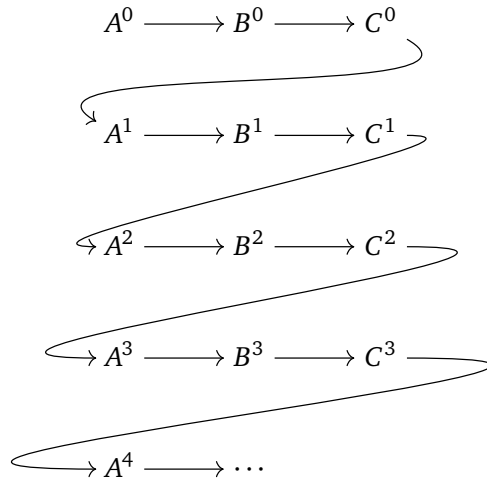


Diagram 52:

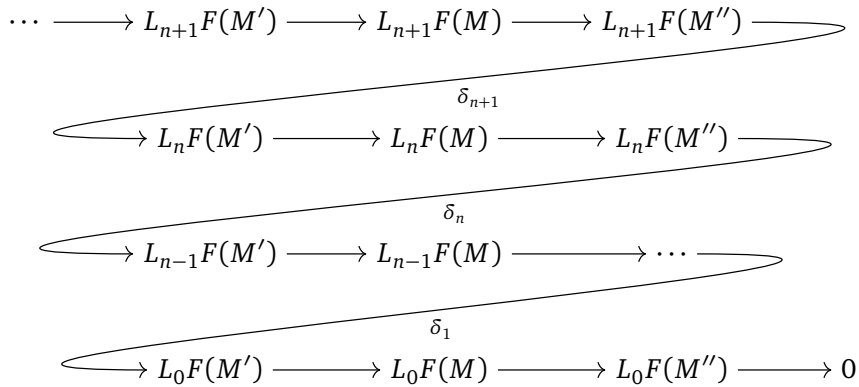


Diagram 53:

$$\begin{aligned} \mathcal{I}(M/N) &= \left\{ \sum_{\text{finite}} x_i(m_i + N) \mid x_i \in \mathcal{I}, m_i \in M \right\} \\ &= \left\{ \sum x_i m_i + N \mid x_i \in \mathcal{I}, m_i \in M \right\} \\ &= (\mathcal{I}M + N)/N \\ &= M/N \end{aligned}$$

Diagram 54:

$$\underbrace{R/\mathcal{I} \oplus R/\mathcal{I} \oplus \cdots \oplus R/\mathcal{I}}_{n \text{ copies}} \cong R^n/\mathcal{I}(R^n)$$

Diagram 55:

$$0 \leq \limsup E_k = \left| \bigcap_{n=1}^{\infty} \bigcup_{k=n}^{\infty} E_k \right| \leq \left| \bigcup_{k=n}^{\infty} E_k \right|_e \leq \sum_{n=N}^{\infty} |E_k|_e < \epsilon$$

Diagram 56:

$$p(\lambda) = \det(\lambda I - T) = \begin{pmatrix} \lambda & 0 & 0 & \cdots & 0 & 0 & -a_1 \\ -1 & \lambda & 0 & \cdots & 0 & 0 & -a_2 \\ 0 & -1 & \lambda & \cdots & 0 & 0 & -a_3 \\ 0 & 0 & -1 & \cdots & 0 & 0 & a_4 \\ \vdots & \vdots & \vdots & \ddots & \vdots & \vdots & \vdots \\ 0 & 0 & 0 & \cdots & -1 & \lambda & -a_{n-1} \\ 0 & 0 & 0 & \cdots & 0 & -1 & \lambda \end{pmatrix}$$

Diagram 57:

$$\begin{pmatrix} a_{1,1} & a_{1,2} & \cdots & \cdots & a_{1,n} \\ a_{2,1} & a_{2,2} & \cdots & \cdots & a_{2,n} \\ \vdots & & \ddots & & \vdots \\ a_{n,1} & a_{n,2} & \cdots & \cdots & a_{n,n} \end{pmatrix}$$

Diagram 58:

$$\iiint_V \frac{\partial \mathbf{F}_i}{\partial x_i} dV = \oiint_S \mathbf{F}_i n_i dS$$

Diagram 59:

$$f^{-1}(n) = \frac{-1}{f(1)} \sum_{\substack{d|n \\ d < n}} f\left(\frac{n}{d}\right) f^{-1}(d) \text{ for } n > 1$$

Diagram 60:

$$\sum_{d|n} \mu(d) = \left[\frac{1}{n} \right] = \begin{cases} 1, & \text{if } n = 1 \\ 0, & \text{if } n > 1 \end{cases}$$

Diagram 61:

$$f(x) = \begin{cases} 2x + 2, & x \leq -2 \\ 2, & -2 < x \leq 2 \\ \frac{1}{2}x + 3, & 2 < x \end{cases}$$

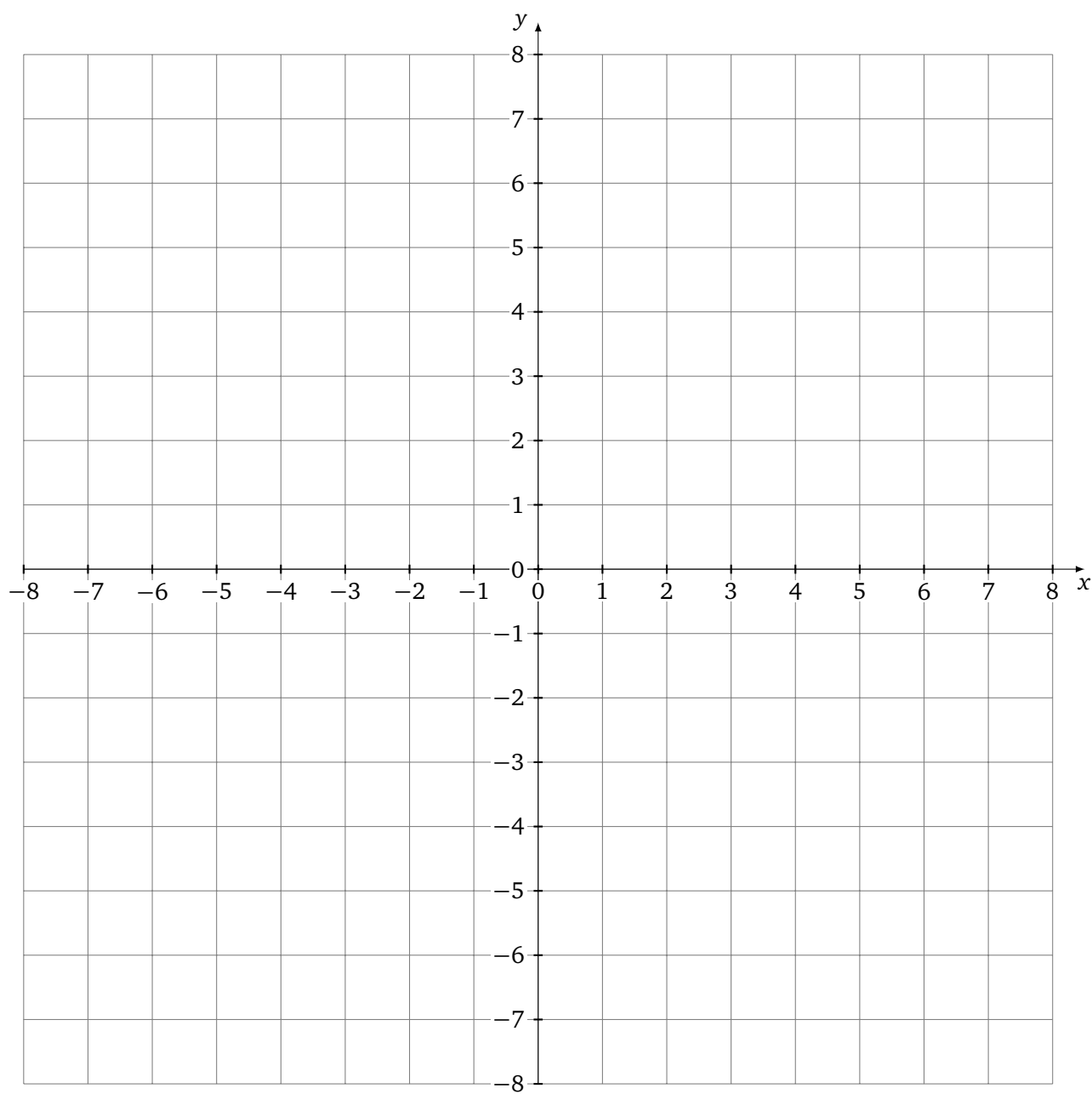
- (a) This is (a)
- (b) This is (b)
- (c) This is (c)
- (1.) This is (1)
- (2.) This is (2)
- (3.) This is (3)
- (1) First part.
 - (a) Here is a subpart.
- (2) Final part.

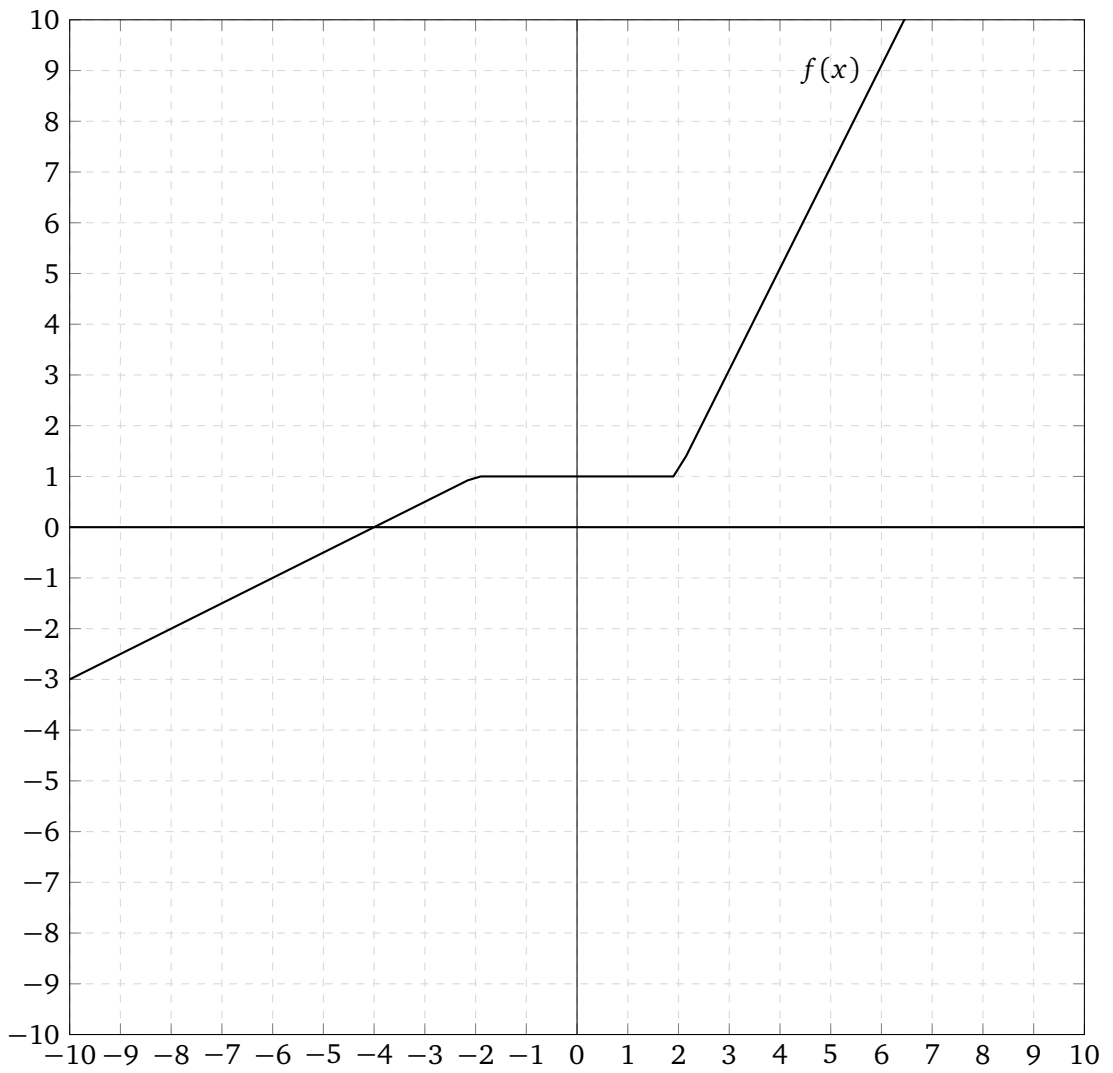
Part Red: Something
Part Blue: Something
Part Green: Something

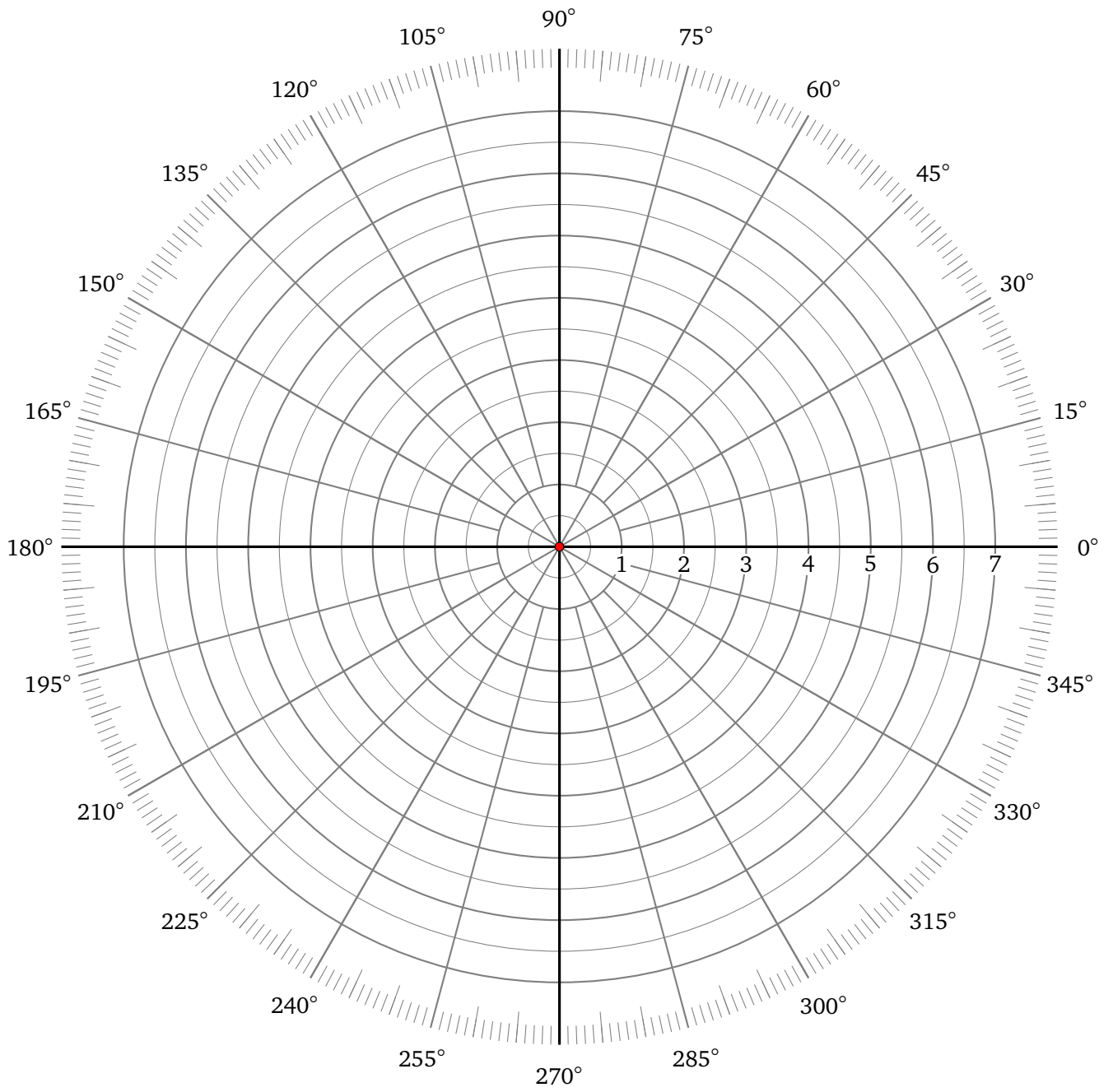
Demonstrating LaTeX within LaTeX: $\int x \, dx = \frac{x^2}{2} + C$

$$\begin{aligned}
 0 &= \frac{\partial^2}{\partial \eta_i^2} 1 = \frac{\partial^2}{\partial \eta_i^2} \int h(x) \exp\left(\sum \eta_i t_i(x) - \bar{c}(\eta)\right) dx \\
 &= \int h(x) \frac{\partial^2}{\partial \eta_i^2} \exp\left(\sum \eta_i t_i(x) - \bar{c}(\eta)\right) dx \\
 &= \int h(x) \frac{\partial}{\partial \eta_i} \left(\left(t_i - \frac{\partial}{\partial \eta_i} \bar{c}(\eta) \right) \exp\left(\sum \eta_i t_i(x) - \bar{c}(\eta)\right) \right) dx \\
 &= \int h(x) \left(-\frac{\partial^2}{\partial \eta_i^2} \bar{c}(\eta) \exp\left(\sum \eta_i t_i(x) - \bar{c}(\eta)\right) + \left(t_i - \frac{\partial}{\partial \eta_i} \bar{c}(\eta) \right)^2 \exp\left(\sum \eta_i t_i(x) - \bar{c}(\eta)\right) \right) dx \\
 &= \int h(x) - \frac{\partial^2}{\partial \eta_i^2} \bar{c}(\eta) \exp\left(\sum \eta_i t_i(x) - \bar{c}(\eta)\right) dx \\
 &\quad + \int h(x) \left(t_i - \frac{\partial}{\partial \eta_i} \bar{c}(\eta) \right)^2 \exp\left(\sum \eta_i t_i(x) - \bar{c}(\eta)\right) dx \\
 &= -\frac{\partial^2}{\partial \eta_i^2} \bar{c}(\eta) + \int h(x) t_i(x)^2 \exp\left(\sum \eta_i t_i(x) - \bar{c}(\eta)\right) dx \\
 &\quad + \int h(x) \left(\frac{\partial}{\partial \eta_i} \bar{c}(\eta) \right)^2 \exp\left(\sum \eta_i t_i(x) - \bar{c}(\eta)\right) dx \\
 &\quad - 2 \frac{\partial \bar{c}(\eta)}{\partial \eta_i} \int t_i(x) h(x) \exp\left(\sum \eta_i t_i(x) - \bar{c}(\eta)\right) dx \\
 &= -\frac{\partial^2}{\partial \eta_i^2} \bar{c}(\eta) + E(t_i^2) - E(t_i)^2 \\
 &= -\frac{\partial^2}{\partial \eta_i^2} \bar{c}(\eta) + \text{var}(t_i)
 \end{aligned}$$

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REFERENCES

- [1] Bending snakes with xy-pic. <http://tex.stackexchange.com/questions/31687/bending-snakes-with-xy-pic>. October 15, 2011.
- [2] How do you draw the “snake” arrow for the connecting homomorphism in the snake lemma?. <http://tex.stackexchange.com/questions/3892/how-do-you-draw-the-snake-arrow-for-the-connecting-homomorphism-> October 8, 2010.
- [3] Curved Arrows in Tikz. <http://tex.stackexchange.com/questions/209942/curved-arrows-in-tikz>. October 31, 2014.
- [4] Milne, James. The tikz package. Guide to Commutative Diagrams. <http://www.jmilne.org/not/Mtikz.pdf>. October 30, 2012.
- [5] Nikolic, Zoran. Polar coordinates template. <http://www.texample.net/tikz/examples/polar-coordinates-template/>. December 15, 2009.