

# Why Linux Is Better!

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Figure 1: Why Linux Is The Best!

## 1 OVERVIEW

[4] Linux is an open-source operating system kernel that serves as the core foundation for various Linux distributions (like Ubuntu, CentOS, and Debian). It provides the essential software components and services necessary to manage hardware resources and run software applications on a computer.

Linux is known for its stability, security, and flexibility and is widely used in servers, desktop computers, embedded systems, and more.

### 1.1 Open Source and Free

Most Linux distributions are open source, which means their source code is freely available. This allows for transparency, collaboration, and customization. Additionally, Linux distributions are often available for free, which can be appealing for individuals and organizations with budget constraints.

**Open Source Community** The vibrant open-source community continuously contributes to improving Linux's performance. With collaboration and testing from developers worldwide, Linux remains at the forefront of performance optimization.

**File Managers** Linux file managers often allow for customization of file handling, views, and shortcuts, improving file organization and navigation.[4]

## 1.2 Performance

Linux is often praised for its efficient resource utilization, making it well-suited for older hardware and resource-constrained environments. It also supports a wide range of hardware architectures.

**Stability and Reliability** Linux is known for its stability and reliability. Many servers and critical infrastructure systems run on Linux due to its ability to run for extended periods without requiring frequent reboots.

## 1.3 Security

Linux's architecture and security model contribute to its reputation for being more secure than some other operating systems. The community's quick response to security vulnerabilities and the ability to fine-tune security settings are considered advantages.

**Development and Scripting** Linux is a popular choice for software development and scripting. Many programming tools, libraries, and frameworks are readily available for Linux, making it a preferred platform for developers.

## 1.4 Community and Support

The Linux community is active and passionate, offering extensive online resources, forums, and documentation. Users can easily find help and solutions to their problems.

**Privacy** Linux distributions generally prioritize user privacy and data protection. Users have more control over what data is collected and shared.

**Licensing** The licensing of Linux and open-source software in general allows users to modify and distribute the software without the same restrictions as proprietary software.

## 1.5 Customizability

Linux offers a high degree of customization. Users can choose from a variety of desktop environments, themes, and software components to create a personalized computing environment that suits their needs.

**Compatibility and Portability** Linux is highly portable and can run on various hardware architectures. It's commonly used in embedded systems, mobile devices, and IoT (Internet of Things) devices.

Linux Mint offers various C++ Integrated Development Environments (IDEs) to choose from, and you can install them based on your preferences.



Figure 2: Linux Distros

System fonts, package manager configurations, and system sounds can all be adjusted to create a unique Linux experience. Additionally, Linux's open-source nature and community support mean that the possibilities for customization are virtually limitless, making it an ideal choice for users who want to tailor their operating system to their specific needs and style.

**User Interface Customization** Users can personalize their desktop experience by customizing icons, widgets, wallpapers, and more. The Linux community often develops and shares themes and icon packs to enhance aesthetics.

**Kernel and System Optimization** [2] Advanced users and system administrators can optimize the Linux kernel and system settings to maximize performance and resource utilization for specific hardware and use cases.

## 1.6 SUMMARY

Linux provides extensive customization options, allowing users to personalize their desktop environments, themes, keyboard shortcuts, and even automate tasks using scripting.

With a variety of desktop environments and window managers to choose from, users can craft a unique computing experience.

Category	Advantage	Description	Example
Open Source	Community-driven Development	Collaborative development based on user feedback.	Ubuntu, Fedora
Customizability	Extensive Personalization	Wide variety of themes and software packages.	GNOME, KDE
Stability	Reliable Performance	Long up-time, ideal for critical systems.	CentOS, Debian
Security	Robust Security Measures	Multi-user architecture, frequent security updates.	SELinux, AppArmor
Community Support	Active User Community	Extensive support through forums and websites.	Stack Exchange, LinuxQuestions.org
Resource Efficiency	Lightweight Distributions	Suitable for older hardware.	Lubuntu, Puppy Linux
Software Management	Centralized Package Management	Easy installation and updates.	apt, yum
Compatibility	Broad Hardware Support	Versatile, supports various devices.	Kernel modules
Command Line Interface	Powerful CLI	Efficient task execution and automation.	Bash, Terminal
Innovation	Cutting-edge Technology	Foundation for modern applications.	Docker, Kubernetes

Table 1: Key Advantages of Linux Operating System

Table 2: Popular Linux Distributions and Their Benefits

Distribution	Usage	Number of Users	Benefits (3 Words)
Ubuntu	Desktop	"20 million"	"User-friendly
Fedora	Desktop	"5 million"	"Innovative
CentOS	Server	"10 million"	"Stable
Debian	Server	"15 million"	"Stable
Arch	Enthusiast	"1 million"	"Lightweight
openSUSE	Desktop	"3 million"	"Stable

## 2 EQUATION

Algebraic Formulas:[1]

$$(\alpha + \beta)^2 = \alpha^2 + \beta^2 + 2\alpha\beta \quad (1)$$

$$\gamma^2 - \lambda^2 = (\gamma + \lambda)(\gamma - \lambda) \quad (2)$$

$$(\alpha - \beta)^3 = \alpha^3 - \beta^3 - 3\alpha\beta(\alpha - \beta) \quad (3)$$

$$\omega^3 - \delta^3 = (\omega - \delta)(\omega^2 + (\delta^2 + \omega\delta)) \quad (4)$$

$$(a - b)^2 = a^2 - 2ab + b^2 \quad (5)$$

$$(\eta - \theta)^2 = (\eta^2 + \theta^2 - 2(\eta\theta)) \quad (6)$$

$$(a-b)^4 = a^4 - 4a^3b + 6a^2b^2 - 4ab^3 + b^4 \quad (7)$$

$$a^4 - b^4 = (a-b)(a+b)(a^2 + b^2) \quad (8)$$

$$a^5 - b^5 = (a-b)(a^4 + a^3b + a^2b^2 + ab^3 + b^4) \quad (9)$$

$$(a + b + c)^2 = a^2 + b^2 + c^2 + 2ab + 2bc + 2ca \quad (10)$$

$$(\rho + \alpha + \omega)^2 = \rho^2 + \alpha^2 + \omega^2 + 2\rho\omega + 2\rho\alpha + 2\rho\omega \quad (11)$$

$$x^3 + y^3 + z^3 - 3xyz = (x + y + z)(x^2 + y^2 + z^2 - xy - yz - xz) \quad (12)$$

### 2.1 PYTHAGOREAN THEOREM

$$c^2 = a^2 + b^2$$

#### 2.1.1 Example

Lets consider a quadratic equation of degree 2 with real roots:

$$x^2 - x - 20 = 0$$

$$x^2 - 5x + 4x - 20 = 0$$

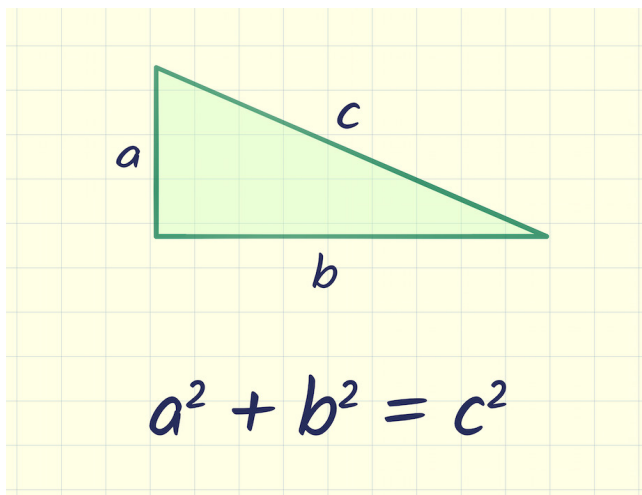


Figure 3: Pythagorean Theorem

$$x(x - 5) + 4(x - 5) = 0$$

$$(x - 5)(x + 4) = 0 \text{ So, } (x - 5) = 0, \text{ and } (x + 4) = 0$$

$$\text{implies: } x - 5 = 0$$

$$x = 5$$

$$\text{And } x + 4 = 0$$

$$x = -4$$

Hence: The roots of the given quadratic equation are:  $x = 5$  and  $x = -4$

### 3 INTEGRATION TABLE

[5]

#### 3.1 Integration of constant

$$\int k dx = kx + C$$

#### 3.2 Closed Curve Integral

$$\oint_C e^x dx = e^x + C$$

#### 3.3 Tripple Integral

$$\iiint \cos(x, y, z) dx dy dz = \sin(x, y, z) + C$$



### 3.4 Definite Integral

$$\int_0^{\pi} \sec^2(x) dx = \tan(x) + C$$

## 4 Matrix

General Matrix :

$$A = \begin{bmatrix} a & b & \cdots & \cdots & e \\ f & g & \cdots & \cdots & j \\ \vdots & \vdots & \ddots & n & \vdots \\ p & q & r & s & t \end{bmatrix}$$

Q.Find A+B, where A and B are square matrices given as:[6]

$$A = \begin{bmatrix} 0 & -1 & 8 \\ 6 & -14 & 2 \\ 9 & 5 & 1 \end{bmatrix}$$

$$B = \begin{bmatrix} -5 & 2 & 0 \\ 7 & -3 & 4 \\ -1 & 3 & 2 \end{bmatrix}$$

OPTIONS: (a)

$$\begin{pmatrix} 1 & 0 & 0 \\ -12 & 15 & 0 \\ 2 & 5 & 12 \end{pmatrix}$$

(b)

$$\begin{pmatrix} 21 & -16 & -1 \\ -12 & 5 & 0 \end{pmatrix}$$

(c)

$$\begin{pmatrix} -5 & 1 & 8 \\ 13 & -17 & 6 \\ 8 & 8 & 3 \end{pmatrix}$$

(d) None

## 5 EINSTEIN'S EQUATION

### 5.1 Equation-1

$$E = mc^2 \tag{13}$$

### 5.2 Equation-2

$$E = h\nu \tag{14}$$

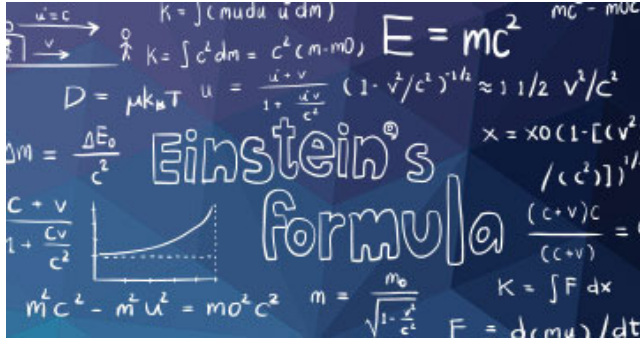


Figure 4: Einstein's Equation

### 5.3 Equation-3

$$v = \frac{c}{\lambda} \quad (15)$$

### 5.4 Equation-4

$$p = mv \quad (16)$$

### 5.5 Equation-5

$$E = \frac{3KT}{2} \quad (17)$$

From (1) (2) (3) (4) and (5) we get :

$$\lambda = \frac{h}{p} = \frac{h}{mv} = \frac{h}{\sqrt{3mKT}}$$

## 6 QUESTIONS

### 6.1 Question-1

[3] Q. Solve :

$$(a) \tan(x) \frac{dy}{dx} = y, y(\pi/2) = \pi/2 \quad (18)$$

$$(b) (1 + \ln(xy))dx + (1 + \frac{x}{y})dy = 0 \quad (19)$$

## 6.2 Question-2

Q. Solve:

$$(a) \int_{-2}^2 \sqrt{1+3x-x^2} dx$$

$$(b) \iint_D \frac{xe^2}{4-y} dy dx$$

$$(c) \iiint_D x \sqrt{y^2 - \log x^2} dx dy dz$$

## 6.3 Question-3

Q. Find determinant:

$$\begin{vmatrix} 5 & 0 & 2 & 0 & -3 \\ 0 & 5 & 0 & 12 & 5 \\ 0 & 0 & 1 & 3 & 0 \\ 1 & 1 & 9 & 1 & 1 \\ 4 & 0 & -2 & 5 & 0 \end{vmatrix}$$

Table 3: Marks Table from CSV Data

Name	RollNo	DSA Marks
Arnav	10	97
Aryan	20	86
Atharva	30	100
Deep	40	81
Idris	50	70
Tanmay	60	95

## References

- [1] Algebra formulas.
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- [3] Encyclopedia Britannica. Algebraic equation, Year.
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- [5] Teachoo. Integration formulas - trig, definite integrals, properties, and more, Year.
- [6] Wikipedia. Matrix (mathematics), Year.