# Linus Has The Utility Function U(x, Y)=x+3 Y . Draw The Indifference Curve That Goes Through Point (3,3),"

**Linus Has The Utility Function U(x, Y)=x+3 Y . Draw The Indifference Curve That Goes Through Point (3,3),**

In this article, we explore the utility function $U(x, Y) = x + 3Y$, which represents Linus's preferences over two goods: $x$ and $Y$. Our goal is to understand how to derive and interpret the indifference curve passing through the point $(3, 3)$. We will analyze the nature of this utility function, illustrate the corresponding indifference curve, and discuss its significance within consumer theory.

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## Understanding the Utility Function $U(x, Y) = x + 3Y$

### Definition and Interpretation of the Utility Function

The utility function $U(x, Y) = x + 3Y$ assigns a numerical measure of satisfaction or preference to any bundle $(x, Y)$. Here:

- $x$ and $Y$ are quantities of two distinct goods.
- The coefficients reflect the relative importance or marginal utility of each good.

In this case:

- The marginal utility of $x$ is 1.
- The marginal utility of $Y$ is 3.

This implies that each additional unit of $Y$ adds three times as much utility as an additional unit of $x$.

### Linearity and Its Implications

The utility function is linear in both variables, which indicates:

- Perfect substitutes: Because the utility is a linear combination, the consumer is willing to substitute $x$ for $Y$ at a constant rate.
- Constant Marginal Utility: Marginal utilities are constant; the consumer's preferences do not change as they consume more of either good.
- Indifference Curves are Straight Lines: The linearity results in indifference curves that are straight lines with a constant slope.

Understanding these properties helps us interpret the consumer's behavior and preferences.

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# Drawing the Indifference Curve Through $(3, 3)$

## Step 1: Calculate the Utility at $(3, 3)$

Given the utility function:

$$
U(x, Y) = x + 3Y
$$

At the point $(3, 3)$:

$$
U(3, 3) = 3 + 3 \times 3 = 3 + 9 = 12
$$

This utility level, $U = 12$, defines the indifference curve passing through $(3, 3)$.

## Step 2: Derive the Equation of the Indifference Curve

An indifference curve is the set of all bundles $(x, Y)$ that give the same utility:

$$
x + 3Y = 12
$$

Rearranged, this becomes:

$$
x = 12 - 3Y
$$

This is the equation of a straight line with:

- Slope: $-3$
- Intercept: $x = 12$ when $Y = 0$

## Step 3: Plotting the Indifference Curve

To graph this line, select some values of $Y$:

| $Y$ | $x = 12 - 3Y$ |
|---|---|
| 0 | 12 |
| 1 | 9 |
| 2 | 6 |
| 3 | 3 |
| 4 | 0 |

Plotting these points gives a straight line connecting:

- $(12, 0)$
- $(9, 1)$
- $(6, 2)$
- $(3, 3)$ (the point given)
- $(0, 4)$

This line represents all bundles that provide Linus with utility 12.

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# Analyzing the Indifference Curve and Consumer Preferences

## Characteristics of the Indifference Curve

Because the utility function is linear, the indifference curves are:

- Straight lines with a slope of $-3$.
- Parallel to each other, each corresponding to a different utility level.

In this particular case, the indifference curve passing through $(3, 3)$

shows all combinations where the weighted sum $x + 3Y$ remains constant at 12.

## Implications of the Slope $-3$

The slope $-3$ indicates the marginal rate of substitution (MRS):

$$
\text{MRS}_{x,Y} = - \frac{\partial U / \partial Y}{\partial U / \partial x} = - \frac{3}{1} = -3
$$

This means:

- Linus is willing to give up 3 units of $x$ to gain one additional unit of $Y$.
- The trade-off is constant across all bundles, consistent with perfect substitutes.

## Consumer Behavior and Choice

Given the utility function's properties:

- Linus's preferences are perfectly substitutable between $x$ and $Y$.
- He values $Y$ three times more than $x$.
- The choice between the two goods depends solely on the relative prices and budget constraints, assuming these are aligned with the marginal utilities.

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# Broader Context: Utility Functions and Indifference Curves

## Comparison with Other Utility Types

- Cobb-Douglas Utility: Curves are convex and bowed inward.
- Perfect Complements: Indifference curves are right angles.
- Perfect Substitutes: Straight lines, as in this case.

The linear utility function demonstrates the simplest form of consumer preferences, where substitution is perfect and constant.

## Economic Significance and Applications

Understanding such utility functions is fundamental in:

- Analyzing consumer choice behavior.
- Deriving demand functions.
- Examining the effects of price changes and income levels.

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# Conclusion

This comprehensive analysis of Linus's utility function $U(x, Y) = x + 3Y$ reveals a straightforward yet insightful perspective on consumer preferences. The indifference curve passing through the point $(3, 3)$ is a straight line:

$$
x + 3Y = 12
$$

with a slope of $-3$, indicating perfect substitutability at a constant rate. The linearity signifies that Linus values $Y$ three times more than $x$, and his willingness to substitute one for the other remains unchanged regardless of the quantities consumed. Such utility functions serve as foundational models in consumer theory, helping economists understand decision-making processes under various economic circumstances.

By graphing these indifference curves and analyzing their properties, we gain deeper insights into the nature of consumer preferences and the underlying principles guiding optimal consumption choices.

# Frequently Asked Questions

## What is the utility function given for Linus, and what does it represent?

The utility function is U(x, Y) = x + 3Y, representing Linus's preferences where his overall satisfaction depends linearly on x and Y, with Y having three times the weight of x.

## How do you find the indifference curve passing

## through the point (3, 3) for this utility function?

To find the indifference curve through (3, 3), set U(x, Y) = U(3, 3). Since U(3, 3) = 3 + 33 = 3 + 9 = 12, the indifference curve is given by x + 3Y = 12.

## What is the equation of the indifference curve that passes through point (3, 3)?

The equation is x + 3Y = 12, which represents all combinations of x and Y that provide the same utility level as point (3, 3).

## How would you graph the indifference curve based on the equation x + 3Y = 12?

To graph it, solve for Y: Y = (12 - x)/3. Plot points such as (0, 4), (3, 3), and (6, 2), and draw a straight line through these points to represent the indifference curve.

## What does the shape of the indifference curve tell us about Linus's preferences for x and Y?

Since the utility function is linear, the indifference curves are straight lines, indicating Linus is willing to substitute between x and Y at a constant rate, with Y being three times as valuable as x in his utility.

# Additional Resources

Understanding the Utility Function U(x, Y) = x + 3Y: A Comprehensive Review

When analyzing consumer preferences and decision-making in microeconomics, utility functions serve as vital tools. They quantify the satisfaction or happiness a consumer derives from different bundles of goods. One such utility function, U(x, Y) = x + 3Y, offers insightful perspectives into consumer choices, especially given its simplicity and linearity. In this review, we will delve deeply into the properties of this utility function, interpret its implications, and construct the indifference curve passing through a specific point—namely, (3,3).

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# Fundamentals of Utility Functions and Their Significance

Before diving into the particular utility function U(x, Y) = x + 3Y, it is

essential to understand the basic concepts:

- Utility Function: Represents a consumer's preference ranking over different bundles of goods. It assigns a real number (utility) to each bundle such that preferred bundles have higher utility.
- Goods x and Y: Typically represent tangible commodities or services. In this context, x and Y could be any goods, but for simplicity, they are often considered as discrete or continuous quantities.
- Indifference Curve: A locus of points (bundles) that provide the consumer with the same level of utility. Moving along an indifference curve indicates the consumer is indifferent between the different combinations of goods.

The utility function U(x, Y) summarizes preferences and guides consumer choices under budget constraints.

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# Analyzing the Utility Function U(x, Y) = x + 3Y

This utility function is linear, which has specific implications:

- Linearity and Additivity: The utility is a linear combination of the quantities of goods x and Y, with coefficients 1 and 3 respectively.
- Marginal Utilities:
- Marginal utility of x: $\partial U/\partial x = 1$
- Marginal utility of Y: $\partial U/\partial Y = 3$

These marginal utilities suggest that each additional unit of x increases utility by 1, while each additional unit of Y increases utility by 3. In other words, Y is "more valuable" or "more influential" in terms of utility contribution than x.

- Implication of Constant Marginal Utilities: Since the marginal utilities are constant, this utility function exhibits perfect substitutes behavior—meaning the consumer is willing to substitute x for Y at a fixed rate without changing overall utility.

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# Constructing Indifference Curves for U(x, Y) = x + 3Y

An indifference curve for a given utility level $U_0$ is defined by the set of (x, Y) satisfying:

$U(x, Y) = x + 3Y = U_0$

Rearranged:

$x = U_0 - 3Y$

This linear equation indicates that indifference curves are straight lines with a slope of -3 in the (x, Y) coordinate plane.

Key points:

- Slope of the indifference curve: -3
- Intercepts:
- When x = 0, $Y = U_0 / 3$
- When Y = 0, $x = U_0$

Because the utility function is linear, the indifference curves are parallel straight lines, each corresponding to a different utility level $U_0$.

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## Properties of the Indifference Curves in U(x, Y) = x + 3Y

- Parallel Lines: All indifference curves are parallel with slope -3.
- No Curvature: The linearity means there are no bowed or convex indifference curves, unlike in typical utility functions exhibiting diminishing marginal utility.
- Preference for Substitutes: The perfect substitution nature indicates that consumers are willing to replace one good with the other at a fixed rate without loss of utility.

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# Drawing the Indifference Curve Passing Through (3, 3)

Now, let's focus on the specific point (3,3). The goal is to find the indifference curve that goes through this point:

Given:

x = 3
Y = 3

Calculate the utility level at this point:

U(3, 3) = 3 + 3 3 = 3 + 9 = 12

Thus, the indifference curve passing through (3, 3) corresponds to the utility level $U_0 = 12$.

Equation of the indifference curve:

$x + 3Y = 12$

Rearranged:

$x = 12 - 3Y$

Plotting the curve:

- When $x = 0$, $Y = 12 / 3 = 4$
- When $Y = 0$, $x = 12$

In the (x, Y) plane, the indifference curve passes through:

- (0, 4)
- (12, 0)

and all points along the line connecting these two intercepts.

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## Graphical Representation

Visualizing this:

- The indifference curve is a straight line with slope -3.
- It intersects the axes at (12, 0) on the x-axis and (0, 4) on the Y-axis.
- Every point on this line yields a utility of 12.

This line can be drawn easily in a coordinate plane, illustrating how different combinations of x and Y maintain the same utility.

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# Interpreting the Indifference Curve and Consumer Preferences

Given the linear utility function and the shape of the indifference curves, several insights emerge:

Perfect Substitutes Behavior

- The consumer perceives x and Y as perfect substitutes with a fixed rate of substitution of 1 unit of x for 3 units of Y.
- Since the marginal utilities are constant, the consumer is indifferent among any combinations along the line x + 3Y = 12.

Implications for Consumer Choice

- The consumer will choose the bundle that maximizes utility within their budget constraint.
- If constrained, the consumer will opt for the combination on the indifference curve that also satisfies their budget constraint, given their prices.

Consumer's Marginal Rate of Substitution (MRS)

- Because the indifference curves are straight lines, the MRS remains constant at all points:

$$MRS = - (\partial U/\partial Y) / (\partial U/\partial x) = -3 / 1 = -3$$

- The negative sign indicates the rate at which the consumer is willing to substitute Y for x without changing utility.

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# Budget Constraints and Optimal Consumer Choice

While the utility function and indifference curves provide important insights, actual consumer choice depends on budget constraints:

- Suppose the consumer faces prices $p_x$ for x and $p_Y$ for Y, and has an income I.
- The budget line is:

$$p_x x + p_Y Y = I$$

- The optimal choice occurs where the highest possible indifference curve is tangent to the budget line or where the consumer's choice lies along the line x + 3Y = 12, depending on their budget and prices.

Key observations:

- Because the indifference curves are straight lines, the consumer's optimal point will be at a corner (interior solution) or on the boundary, depending on their budget constraints.
- The consumer may prefer to consume only one good if prices favor such a choice, given the perfect substitution nature.

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# Applications and Broader Implications

The utility function U(x, Y) = x + 3Y, with its linearity and perfect substitution characteristics, is a valuable model in various economic scenarios:

1. Modeling Perfect Substitutes

- Used when goods are perfect substitutes, meaning the consumer perceives them as interchangeable at a fixed rate.
- Examples include different brands of the same product or commodities that serve identical purposes.

2. Analyzing Consumer Response to Price Changes

- Since the consumer perceives goods as interchangeable, a change in relative prices causes a straightforward substitution without altering the overall utility.

3. Policy Implications

- Understanding such preferences helps policymakers anticipate consumer reactions to taxes, subsidies, or price controls on specific goods.

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# Limitations and Considerations

While the utility function U(x, Y) = x + 3Y offers clarity, it also embodies limitations:

- Assumption of Perfect Substitutes: Real-world preferences often involve diminishing marginal utility and non-linear preferences.
- Linearity: Implies constant marginal utilities, which may not hold for many goods, especially with satiation or preference shifts.
- Simplistic Model: Does not account for income effects or changes in preferences over different consumption levels.

Despite these limitations, it remains a useful pedagogical tool and a baseline model for understanding substitution behavior.

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# Conclusion

The utility function U(x, Y) = x + 3Y embodies a straightforward, yet powerful, model of consumer preferences characterized by perfect substitutes. Its linear form results in indifference curves that are straight lines with a fixed slope of -3, passing through all points where the total utility equals a specified level.

Specifically, the indifference curve passing through the point (3, 3) is described by:

x + 3Y = 12

or equivalently,

x = 12 - 3Y

This line intersects the axes at (12, 0) and (0, 4), providing a clear visualization of the trade-offs the consumer is willing to make between goods x

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