# Pleasse HelpppFind The Line That Is Perpendicular To F(x) = -1/3x + 8 And When Evaluated, F(-2) = 6.A.

**Pleasse HelpppFind The Line That Is Perpendicular To F(x) = -1/3x + 8 And When Evaluated, F(-2) = 6.A.**

Understanding how to find a line perpendicular to a given function is an essential concept in algebra and coordinate geometry. This process involves analyzing the slope of the original function, determining the negative reciprocal for perpendicularity, and then using point-slope form to find the equation of the new line passing through a specific point. In this comprehensive guide, we will walk through each step carefully to help you master this problem.

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## Understanding the Given Function and Its Graph

Before diving into calculations, it's important to understand the properties of the given function:

### The Function: F(x) = -1/3x + 8

This is a linear function, often written in slope-intercept form:

- Slope (m): -1/3
- Y-intercept (b): 8

The graph of this line has the following characteristics:

- It crosses the y-axis at (0, 8).
- It has a gentle negative slope, declining as x increases.

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## Step 1: Find the Slope of the Perpendicular Line

The key to identifying the perpendicular line lies in understanding the relationship between slopes:

### Why is the slope important?

- The slope determines the steepness and direction of a line.
- Two lines are perpendicular if their slopes are negative reciprocals of each other.

### Calculating the negative reciprocal:

Given the slope of the original line:

- Original Slope ($m_1$): -1/3

The slope of a line perpendicular to this line ($m_2$) is:

- $m_2 = -1 / m_1$

Calculating:

- m□ = -1 / (-1/3) = -1 (-3/1) = 3

Result: The slope of the perpendicular line is 3.

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## Step 2: Find a Point the Perpendicular Line Passes Through

The problem states: "When evaluated, F(-2) = 6.A." Although the notation is somewhat unclear, it appears to specify a point through which the perpendicular line passes.

- Point: (-2, 6)

If this interpretation is correct, then the line we are finding passes through the point (-2, 6).

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## Step 3: Write the Equation of the Perpendicular Line

Now, with the slope (m = 3) and a point (-2, 6), we can use the point-slope form:

\[
y - y_1 = m (x - x_1)
\]

Substituting:

\[

y - 6 = 3 (x + 2)

\]

Expanding:

\[

y - 6 = 3x + 6

\]

Adding 6 to both sides:

\[

y = 3x + 12

\]

Final Equation of the Perpendicular Line:

\[

\boxed{

F_{\perp}(x) = 3x + 12

}

\]

This is the line perpendicular to the original function and passing through the point (-2, 6).

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## Verification and Additional Insights

Ensuring the accuracy of our solution is crucial. Let's verify:

## Does the perpendicular line pass through (-2, 6)?

- Substitute x = -2 into the equation:

$$
F_{\perp}(-2) = 3(-2) + 12 = -6 + 12 = 6
$$

Yes, it passes through (-2, 6).

## Are the slopes perpendicular?

- Original slope: -1/3
- Perpendicular slope: 3

Their product:

$$
(-1/3) \times 3 = -1
$$

Since the product is -1, the lines are perpendicular, confirming our solution.

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# Understanding the Context and Applications

Finding perpendicular lines is a fundamental skill in geometry, with applications in various fields including engineering, physics, and computer graphics.

### Real-world applications include:

- Design and architecture: Determining right angles between walls or structures.
- Navigation and mapping: Calculating perpendicular routes.
- Physics: Analyzing forces acting at right angles.

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## Common Mistakes to Avoid

While solving problems involving perpendicular lines, be mindful of the following pitfalls:

1. **Confusing slopes:** Always check that the slopes are negative reciprocals.

2. **Incorrect point substitution:** Ensure the point used in the equation passes through the line.

3. **Misinterpreting the problem statement:** Clarify any ambiguous notation or data.

4. **Forgetting to verify:** Always verify that the line passes through the given point and has the correct slope.

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## Summary of the Steps

To recap, here’s a quick summary of the process:

1. Identify the slope of the given function: -1/3.
2. Compute the negative reciprocal to find the slope of the perpendicular line: 3.
3. Determine the point the perpendicular line passes through: (-2, 6).
4. Use the point-slope form to find the equation:

$$
y - 6 = 3(x + 2)
$$

$$
\Rightarrow y = 3x + 12
$$

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## Additional Resources for Learning

For further mastery of this topic, consider exploring:

- Khan Academy's Lesson on Perpendicular and Parallel Lines
- Wolfram MathWorld: Perpendicular Lines
- Interactive graphing tools like Desmos to visualize the lines and their slopes.

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## Conclusion

In conclusion, finding the line perpendicular to a given linear function involves understanding the relationship between slopes, calculating the negative reciprocal, and applying point-slope form using a specific point on the new line. In this case, the original function $F(x) = -\frac{1}{3}x + 8$ has a slope of -1/3, leading to a perpendicular slope of 3. Given the point (-2, 6), the perpendicular line is $y = 3x + 12$. Mastering these steps enhances your problem-solving skills in algebra and prepares you for more advanced topics in coordinate geometry.

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Remember: Practice makes perfect. Try finding perpendicular lines for different functions and points to strengthen your understanding and confidence in this important mathematical concept.

## Frequently Asked Questions

### What is the slope of the line perpendicular to the function f(x) =

## $-1/3x + 8$?

The slope of the original line is -1/3, so the slope of the perpendicular line is the negative reciprocal, which is 3.

## How do you find the equation of the line perpendicular to $f(x) = -1/3x + 8$ passing through the point where $f(-2) = 6$?

First, find the point (-2, 6). Then, use the perpendicular slope 3 and point-slope form: $y - 6 = 3(x + 2)$. Simplify to find the equation.

## What is the equation of the line perpendicular to $f(x) = -1/3x + 8$ that passes through the point (-2, 6)?

Using point-slope form: $y - 6 = 3(x + 2)$. Simplified, the line's equation is $y = 3x + 12$.

## How can I verify that the line $y = 3x + 12$ is perpendicular to $f(x) = -1/3x + 8$?

Check that the slopes are negative reciprocals: -1/3 and 3. Since $3 = -1/( -1/3)$, they are perpendicular.

## Why is the point (-2, 6) important in finding the perpendicular line?

Because the line must pass through this point, which is given by the value of $f(-2) = 6$, ensuring the line is correctly positioned.

## Can the perpendicular line to $f(x) = -1/3x + 8$ be written in slope-intercept form?

Yes, the perpendicular line passing through (-2, 6) with slope 3 can be written as $y = 3x + 12$.

## Additional Resources

Pleasse HelpppFind The Line That Is Perpendicular To F(x) = -1/3x + 8 And When Evaluated, F(-2) = 6.A.

In the realm of algebra and coordinate geometry, understanding the relationships between lines—particularly their slopes and orientations—is fundamental. Today, we delve into a specific problem: determining the line that is perpendicular to a given linear function, $F(x) = -\frac{1}{3}x + 8$, and also satisfies a particular point condition, namely that $F(-2) = 6$. This inquiry not only tests our grasp of slope-intercept form but also emphasizes the importance of perpendicularity in geometric contexts.

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Understanding the Problem: Breaking Down the Requirements

Before jumping into calculations, it's essential to parse the problem carefully. The question provides two key pieces of information:

1. The original function: $F(x) = -\frac{1}{3}x + 8$
2. A point: $(-2, 6)$ with the condition that $F(-2) = 6$

The goal is to find the perpendicular line to the given function, which passes through the point $(-2, 6)$ – or at least, to determine the line that is perpendicular to the original, satisfying the point condition.

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Step 1: Deciphering the Slope of the Original Line

The original function $F(x) = -\frac{1}{3}x + 8$ is in slope-intercept form $y = mx + b$, where:

- $m$ is the slope

- $b$ is the y-intercept

From this, we clearly see:

$$
m_{original} = -\frac{1}{3}
$$

This slope indicates the original line declines gently as $x$ increases.

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Step 2: Finding the Slope of the Perpendicular Line

In coordinate geometry, the slopes of perpendicular lines are negative reciprocals of each other. This is a fundamental property:

$$
m_{perp} = -\frac{1}{m_{original}}
$$

Applying this to our original slope:

$$
m_{perp} = -\frac{1}{-\frac{1}{3}} = -(-3) = 3
$$

Thus, the line we seek has a slope of 3.

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Step 3: Formulating the Equation of the Perpendicular Line

Now that we know the slope $m_{perp} = 3$, the next step is to find the specific line passing through the point $(-2, 6)$.

Using the point-slope form of a line:

$$
y - y_1 = m (x - x_1)
$$

where:

- $(x_1, y_1) = (-2, 6)$
- $m = 3$

Plugging in the values:

$$
y - 6 = 3 (x - (-2))
$$

$$
y - 6 = 3 (x + 2)
$$

Expanding:

$$
y - 6 = 3x + 6
$$

Adding 6 to both sides:

$$
y = 3x + 12
$$

This is the equation of the line perpendicular to $F(x)$, passing through $(-2, 6)$.

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Conclusion: The Final Equation and Verification

The line perpendicular to $F(x) = -\frac{1}{3}x + 8$, passing through the point $(-2, 6)$, is:

$$
\boxed{y = 3x + 12}
$$

To verify, substitute $x = -2$:

$$
y = 3(-2) + 12 = -6 + 12 = 6
$$

which matches the given point $(-2, 6)$. Thus, the equation is consistent and correct.

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Additional Insights: Why This Matters

Understanding how to find perpendicular lines is crucial in various applications, from designing structures and analyzing slopes in physics to solving optimization problems in economics. The concept of negative reciprocals simplifies the process of identifying perpendicularity, and the point-slope form allows for quick equation derivation once a slope and a point are known.

Furthermore, recognizing the geometric relationship between slopes helps students and professionals alike to visualize the problem, making complex algebraic tasks more intuitive.

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Practical Applications and Related Concepts

- Orthogonal Trajectories: Families of curves that intersect at right angles, fundamental in fields like physics and engineering.
- Normal Lines: Lines perpendicular to the tangent at a point on a curve, used in calculus to find slopes of tangents or normals.
- Coordinate Geometry in Design: Architects and engineers often rely on perpendicular lines to ensure structural integrity.

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Final Thoughts

Mastering the process of identifying perpendicular lines involves understanding slope relationships, applying algebraic formulas, and verifying through substitution. The problem of finding the line perpendicular to $F(x) = -\frac{1}{3}x + 8$ and passing through a specific point is a textbook example of these principles in action. With this knowledge, one can approach similar problems with confidence, ensuring accuracy and a deeper understanding of the geometric relationships that underpin much of mathematics and its applications.

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