

# Intersection of Two Lines

## *MATLAB Implementation*

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Tamas Kis | [kis@stanford.edu](mailto:kis@stanford.edu)

TAMAS KIS  
<https://github.com/tamaskis>

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## Contents

<b>line_intersection</b>	<b>4</b>
Syntax . . . . .	4
Description . . . . .	4
Examples . . . . .	4
Links . . . . .	5
<b>Intersection of Two Lines</b>	<b>6</b>

# line\_intersection

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Finds the intersection of two lines.

## Syntax

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```
[x,y] = line_intersection([m1,b1],[m2,b2])  
[x,y] = line_intersection([x1,y1,m1],[x2,y2,m2])
```

## Description

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`[x,y] = line_intersection([m1,b1],[m2,b2])` returns the intersection  $(x,y)$  of two lines given in slope-intercept form:

1.  $y_1 = m_1x + b_1$
2.  $y_2 = m_2x + b_2$

`[x,y] = line_intersection([m1,b1],[m2,b2])` returns the intersection  $(x,y)$  of two lines given in point-slope form:

1.  $y - y_1 = m_1(x - x_1)$
2.  $y - y_2 = m_2(x - x_2)$

## Examples

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### Example 1

Find the intersection of  $y = 5x + 2$  and  $y - 4 = 7(x - 10)$ .

#### ■ SOLUTION

To find the intersection point, we just have to note that for the first line, we have  $m_1 = 5$  and  $b_1 = 2$ , while for the second line, we have  $x_2 = 10$ ,  $y_2 = 4$ , and  $m_2 = 7$ .

```
% line 1 parameters  
m1 = 5;  
b1 = 2;  
  
% line 2 parameters  
x2 = 10;  
y2 = 4;  
m2 = 7;  
  
% finds intersection point  
[x_int,y_int] = line_intersection([m1,b1],[x2,y2,m2])
```

This yields the result

```
x_int =  
34
```

```
y_int =  
172
```

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## Links

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MATLAB® Central's File Exchange:

[https://www.mathworks.com/matlabcentral/fileexchange/85428-intersection-of-two-lines-line\\_intersection](https://www.mathworks.com/matlabcentral/fileexchange/85428-intersection-of-two-lines-line_intersection)

GitHub®:

[https://github.com/tamaskis/line\\_intersection-MATLAB](https://github.com/tamaskis/line_intersection-MATLAB)

## Intersection of Two Lines

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Consider the following two lines given in point-slope form:

$$y - y_1 = m_1 (x - x_1)$$

$$y - y_2 = m_2 (x - x_2)$$

If these two lines intersect at  $(x_{\text{int}}, y_{\text{int}})$ , then

$$y_{\text{int}} - y_1 = m_1 (x_{\text{int}} - x_1) \tag{1}$$

$$y_{\text{int}} - y_2 = m_2 (x_{\text{int}} - x_2) \tag{2}$$

Solving Eqs. (1) and (2) for  $y_{\text{int}}$ ,

$$y_{\text{int}} = y_1 + m_1 (x_{\text{int}} - x_1) \tag{3}$$

$$y_{\text{int}} = y_2 + m_2 (x_{\text{int}} - x_2) \tag{4}$$

Equating Eqs. (3) and (4),

$$y_1 + m_1 (x_{\text{int}} - x_1) = y_2 + m_2 (x_{\text{int}} - x_2)$$

Solving for  $x_{\text{int}}$ ,

$$x_{\text{int}} = \frac{(m_1 x_1 - m_2 x_2) - (y_1 - y_2)}{m_1 - m_2} \tag{5}$$

To obtain  $y_{\text{int}}$ , we can use either line. We choose to use line 1.

$$y_{\text{int}} = y_1 + m_1 (x_{\text{int}} - x_1) \tag{6}$$