#### Normal distribution 4.9

In the following subsections, we will only compute probabilities involving "<". However, since the normal distribution is continuous, you could replace all the "<" by a "<", and the result would be the same.

#### Compute $P(X \le a)$ with Normal Cdf function 4.9.1

Consider a random variable  $X \sim \mathcal{N}(5, 3^2)$ .<sup>1</sup> Suppose you want to compute  $\mathbf{P}(X \leq 4)$ .

Press , select Probability > Distributions > Normal Cdf, choose a huge negative value for lower (like  $-10^{10}$ ), and upper : 4 (here  $\mu = 5$  and  $\sigma = 3$ ):

•	1.1	Þ	*Doc		CAP	<sup>S</sup> RAD	
		Normal Cdf					^
		Lower Bound:	-10^10			•	
		Upper Bound:	4			•	
		μ:	5			•	
		σ:	3			•	
				ОК	Can	cel	

Press then

enter

Here the result should be 0.369 (rounded).

# **4.9.2** Compute $P(X \ge a)$ with Normal Cdf function

Consider a random variable  $X \sim \mathcal{N}(5, 3^2)$ . Suppose you want to compute  $\mathbf{P}(X \ge 4)$ .

Press , select Probability > Distributions > Normal Cdf, choose a huge positive value for upper (like  $10^{10}$ ), and lower : 4 (here  $\mu = 5$  and  $\sigma = 3$ ):

◀ 1	.1	Þ	*Doc		CAP	' <sup>s</sup> RA	D 🚺	×
no	rm	Normal Cdf					41	
		Lower Bound:	4			•		
		Upper Bound:	10^10			•		
		μ:	5			•		
		σ:	3			×		
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<sup>1</sup>The IB notation for the normal distribution is  $\mathcal{N}(\mu, \sigma^2)$ , but the TI-Nspire works with  $\sigma$ . We write 3<sup>2</sup> to express that  $\sigma = 3$ .

Press then enter

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Here the result should be 0.631 (rounded).

#### **4.9.3** Compute $P(a \le X \le b)$ with Normal Cdf function

Consider a random variable  $X \sim \mathcal{N}(5, 3^2)$ . Suppose you want to compute  $\mathbf{P}(-2 \le X \le 6)$ . Press  $\mathbf{Press}$ , select Probability > Distributions > Normal Cdf, choose **upper** : 6, and **lower** : -2 (here  $\mu = 5$  and  $\sigma = 3$ ):



Press then enter

enter . The result should be 0.621 (rounded).

## **4.9.4** Find x when $P(X \le x) = c$ with Inverse Normal function

Consider a random variable  $X \sim \mathcal{N}(5, 3^2)$ . Suppose you want to know for what x we have  $\mathbf{P}(X \leq x) = 0.3$ .

Press  $\mu = 5$  and  $\sigma = 3$ ):

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I	Area:	0.3		•		
	μ:	5		•		
	σ:	3		•		
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						-

Press then

enter . The result should be x = 3.43 (rounded).

## 4.9.5 Plot a normal distribution

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Consider a random variable  $X \sim \mathcal{N}(5, 3^2)$ .

① To plot the distribution in the calculator, create a new document and select Add Graphs.

2 Enter  $f_1(x)=normPdf(x,5,3)$ '. Press enter

3 Choose an appropriate window. Here we chose the following:

Window Settings							
XMin:	-20						
XMax:	20						
XScale:	Auto 🕨						
YMin:	-0.0132974940446						
YMax:	0.1462783813683						
YScale:	Auto			•			
		ОК	Can	cel			

The graph should look like this:

