

## Diagnostic test

Success in Calculus depends to a large extent on knowledge of the mathematics that precedes calculus: algebra, analytic geometry, functions and trigonometry. The following test is intended to diagnose weaknesses that you might have in these areas.

If necessary, refresh your skills by referring to the materials from the preliminary course. If you have had difficulty with these problems, you should look at book

J. Stewart: *Essential Calculus*, Sections “Review of Analytic Geometry” and “Review of Conic Section”

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1. Rewrite  $x^2 + x + 1$  by completing the square. Sketch the graph of the function  $f(x) = x^2 + x + 1$ .

2. Sketch the graph of  $x^2 + 5y^2 - 2x = 4$  and locate the foci.

3. Find the intersection of ellipse  $x^2 + 5y^2 - 2x = 4$  and line  $y = x$

4. Find an equation of the ellipse with foci  $[0, \pm 2]$  and major vertices  $[0, \pm 3]$ .

5. Find an equation for the line that passes through the point  $[3, 1]$  and

a) has slope -3.

b) is parallel to the line  $2x - 4y = 3$

6. Find the center and radius of the circle with equation  $x^2 + y^2 - 6x + 10y + 9 = 0$ .

7. Find an equation for the circle that has center  $[-1, 4]$  and passes through the point  $[3, -2]$ .

8. Sketch the region in  $xy$ -plane defined by the inequality  $x^2 + y^2 < 4$ .

9. Convert from degrees to radians

a)  $300^\circ$

b)  $-18^\circ$

Convert from radians to degrees:

a)  $\frac{5\pi}{6}$

b) 2

10. Find the length of an arc of a circle with radius 12 cm if the arc subtends a central angle of  $30^\circ$ .

11\* Determine the radius of parallel of latitude  $30^\circ$  N. As a reference surface take the sphere (globe) with the radius  $R = 6378$  km.

