

Application of theorems of elementary geometry in a mathematical analysis

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Among the theorems in elementary geometry there are some known very well, for example, Pythagorean Theorem. All students know it and know how to use it. In the meantime, there are theorems that raise some questions about how and where to use them. For example, if an altitude is dropped from the vertex with the right angle to the hypotenuse then the product of the catheti projections on the hypotenuse is equal to the length of the altitude squared. Another example would be – if a secant and a tangent are drawn from a point outside the circle, then the product of the lengths of the secant and its external segment equals the square of the length of the tangent segment. There are many similar theorems. We decided to use these theorems in mathematical analysis to draw functions using only a ruler

and a compass. It turns out that it is possible to easily draw new functions based on graphically defined functions. We have proven and showed how to draw functions $y = \frac{1}{f(x)}$, $y = \sqrt{f(x)}$, $y = f^{2p}(x)$, $y = \frac{1}{f^{2p}(x)}$, $y = \frac{1}{\sqrt{f(x)}}$, if there is a function $f(x)$ defined graphically. In addition, we used Ptolemy's theorem to draw function $y = f(x)g(x)$ if there are two functions – $f(x)$ and $g(x)$ – defined graphically. Using triangle angle bisector theorem (an angle bisector of an angle of a triangle divides the opposite side in two segments that are proportional to the other two sides of the triangle), it is possible to draw function $y = \frac{f(x)}{g(x)}$ if there are two functions – $f(x)$ and $g(x)$ – defined graphically.

References

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