

Work sheet - convexity/concavity of a function

Let's have a function

$$f(x) = \frac{x}{3-x^2}$$

and its first derivative

$$f'(x) = \frac{3+x^2}{(3-x^2)^2}$$

Tasks:

a) make the graph of the function $f(x)$ using the Geogebra application.

b) compute the second derivative of the function.

c) specify intervals on which the second derivative is positive or negative; write it in the following table

Interval				
$f''(x)$				

d) the function $f(x)$ graph goes through the following points

$$A = \left[-1, -\frac{1}{2}\right], B = [0, 0], C = \left[1, \frac{1}{2}\right].$$

determine equations of the tangent lines in these points and add their graphs on the Geogebra canvas.

e) look at the neighborhood of the points A, B, C and compare the mutual position of the function graph and the tangent line in these points. Try to research how is this geometric relation connected with the sign of the function's second derivative.

Final task: make conclusions from your inquiry.