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Computing Lab (Assignment 5)

Explanation of problem 5

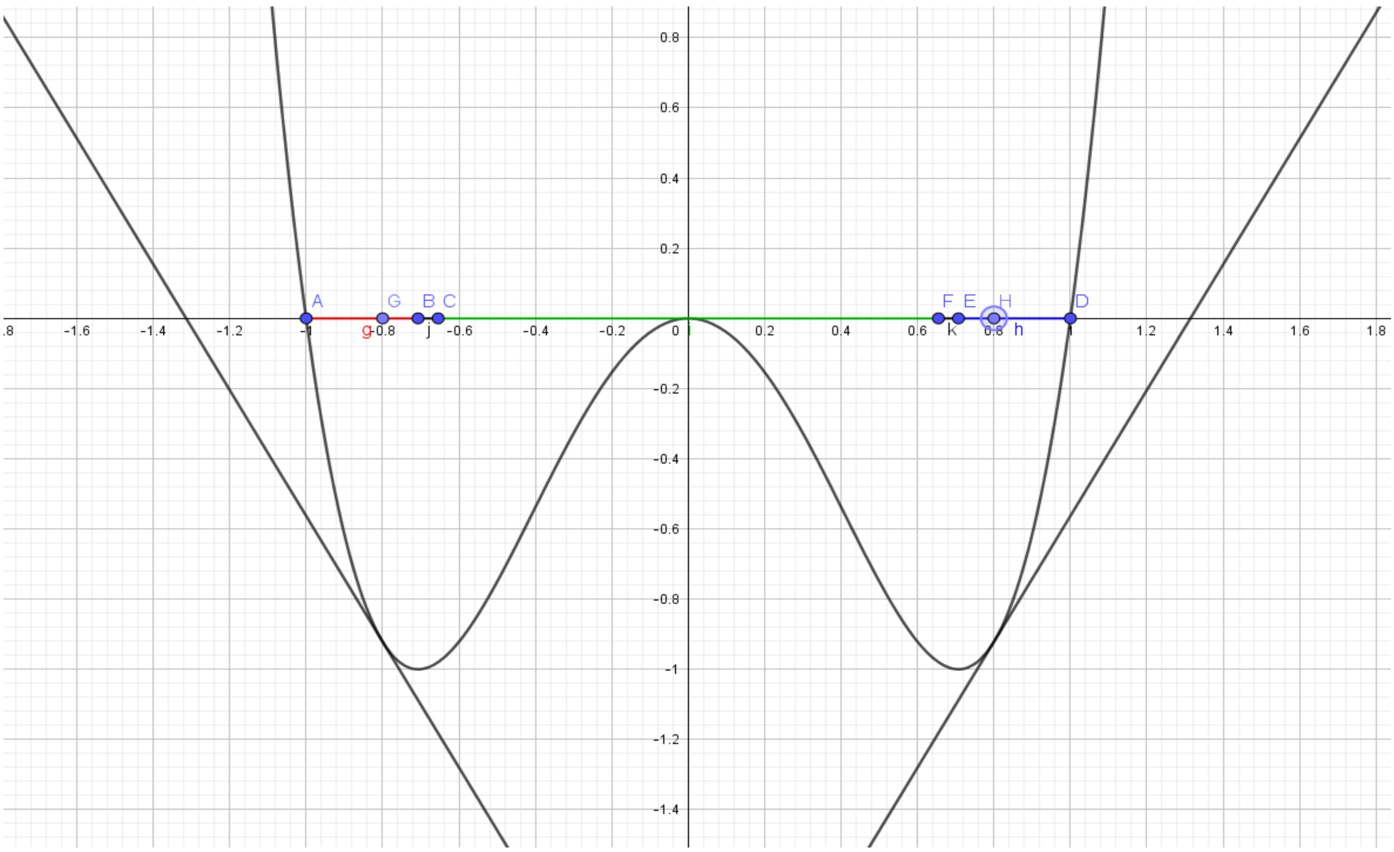
The given function is-

f(x) = $\mathbf{4x^4 - 4x^2}$

We can plot the function in Geogebra and we can say that the roots of the function is -1,0 and +1.

Now we are solving the given equation by Newton Raphson method by taking different initial guesses.

(1) If we take the initial guess between point -1 to $-\frac{\sqrt{2}}{2}$ and $+\frac{\sqrt{2}}{2}$ to +1 .



Point G is in between points A and B i.e. -1 and $-\frac{\sqrt{2}}{2}$,the tangent corresponding to this point is in such a way that it will lead to the convergence to -1. Similarly point H is in between points E and D i.e. $+\frac{\sqrt{2}}{2}$ and +1, the tangent corresponding to this point is in such a way that it will lead to the convergence to +1.

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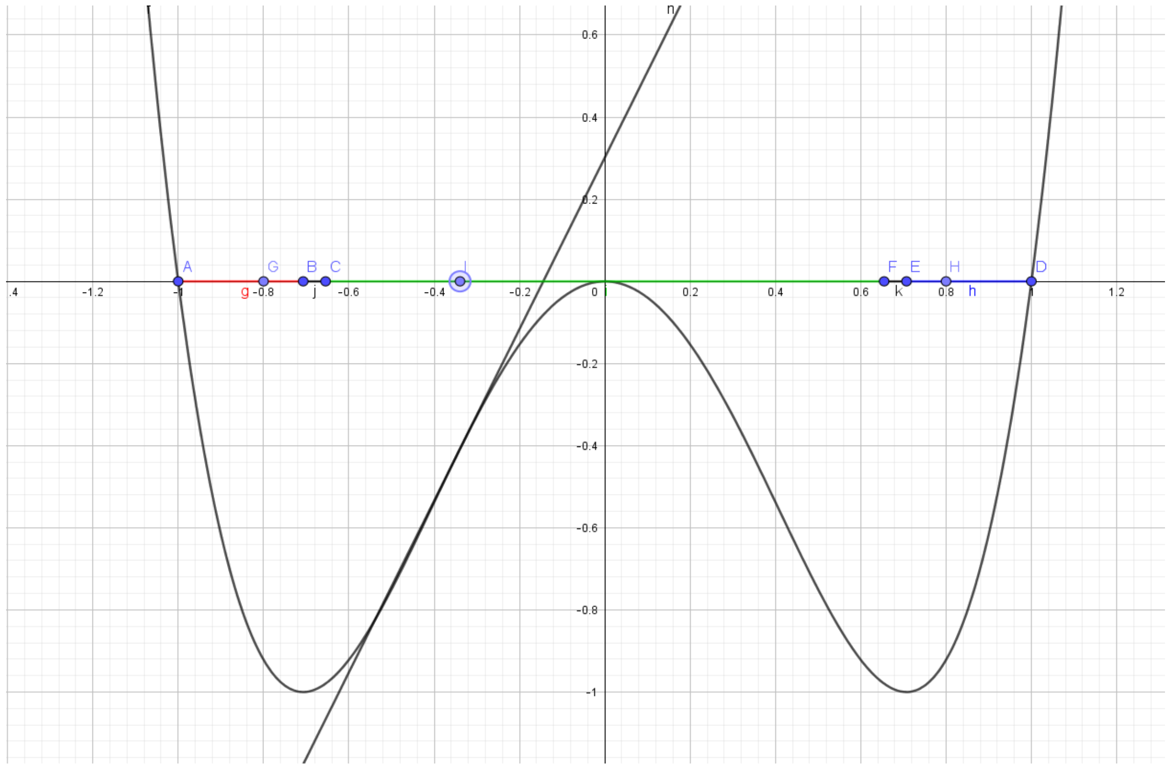
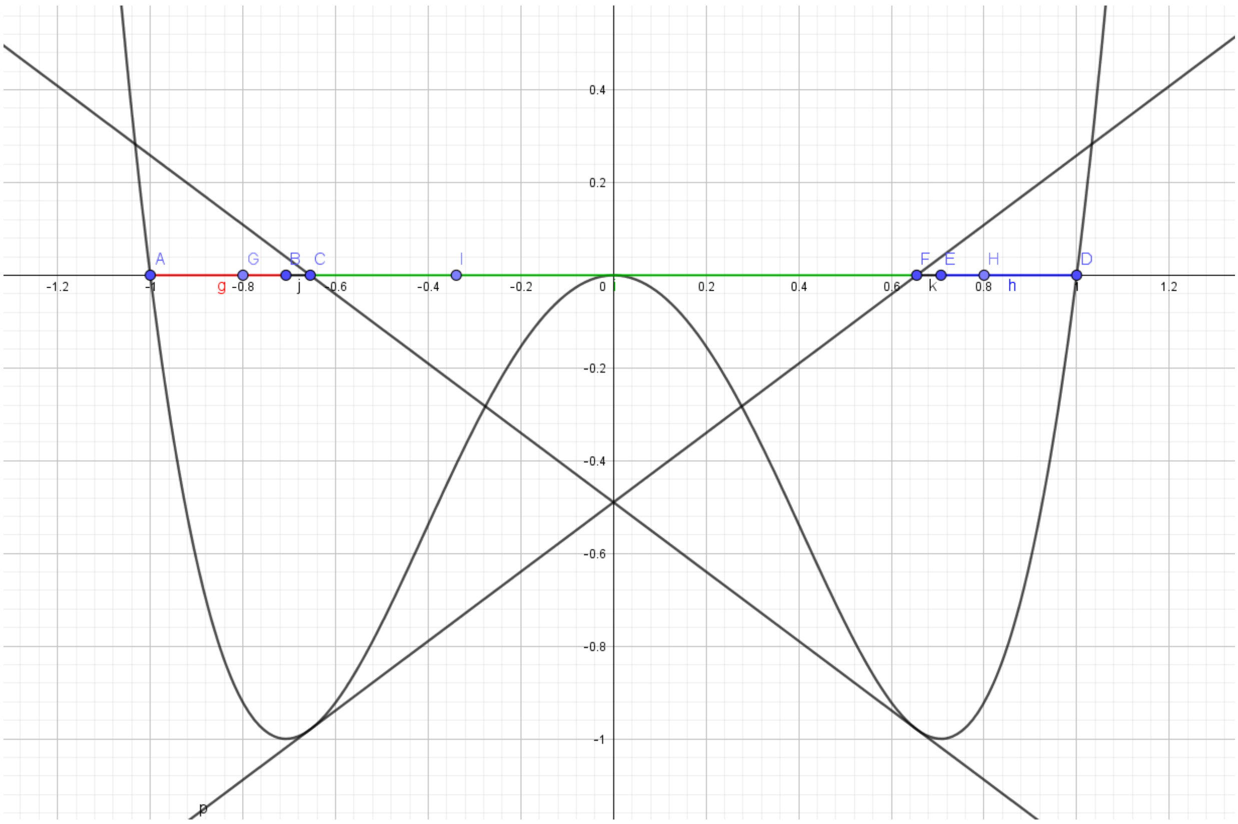
(2) If we take initial guess between $-\frac{\sqrt{21}}{7}$ to $+\frac{\sqrt{21}}{7}$.



Point "I" is in between points C and F i.e. $-\frac{\sqrt{21}}{7}$ and $+\frac{\sqrt{21}}{7}$,the tangent corresponding to the point "I" is in such a way that it will lead to the convergence to the 0 .

(3) If we take the initial guess as $\pm\frac{\sqrt{21}}{7}$.



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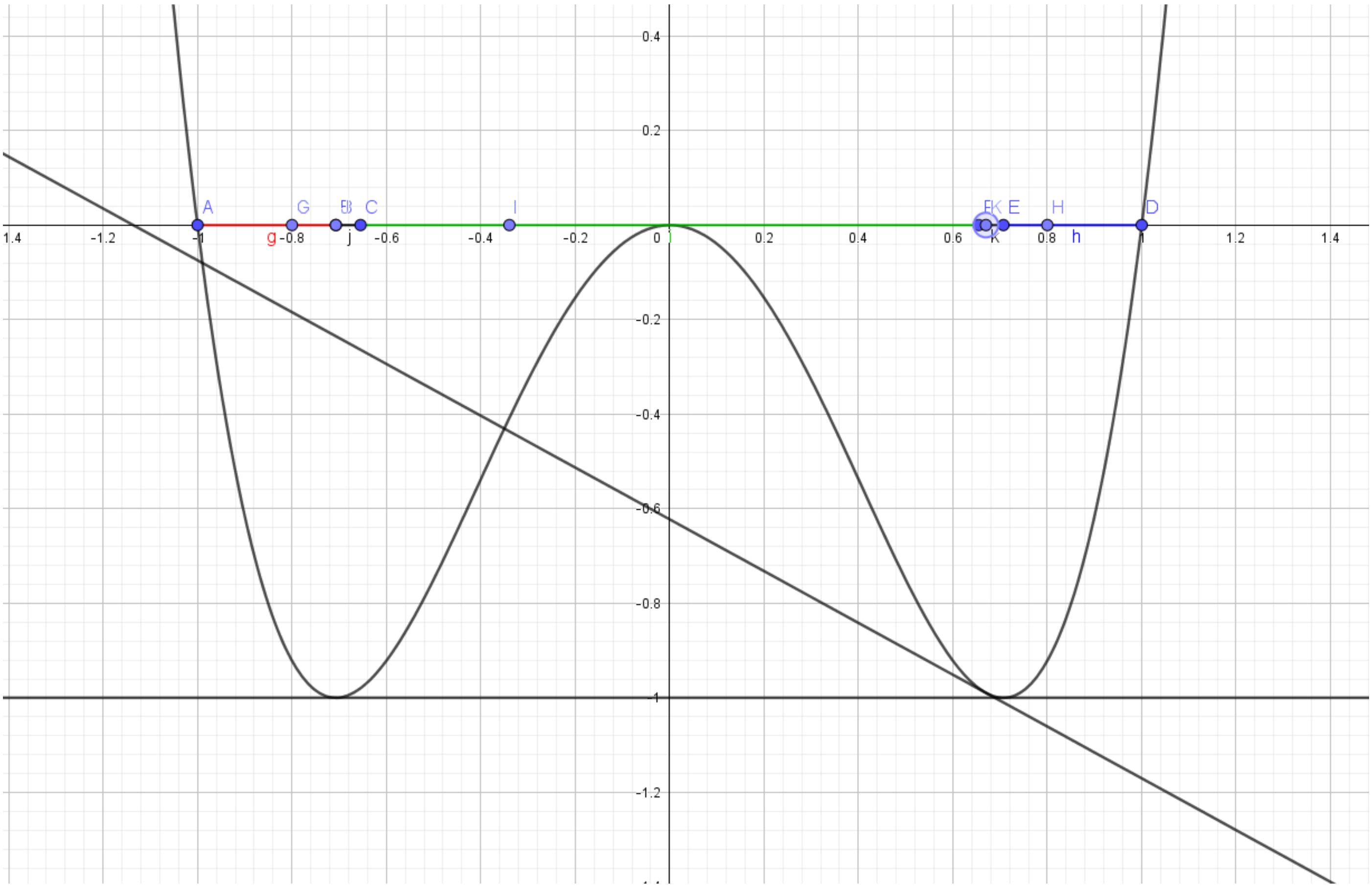
In above figure, point C and point F represent the - $\frac{\sqrt{21}}{7}$ and + $\frac{\sqrt{21}}{7}$ respectively. If we take initial guess as - $\frac{\sqrt{21}}{7}$ it will iterate the solution to + $\frac{\sqrt{21}}{7}$ that will again iterate to the solution to - $\frac{\sqrt{21}}{7}$ and process will keep on repeating or we can say it will oscillate between these two values hence it will not converge to the correct solution.

(4) If we take initial guess between $\frac{\sqrt{21}}{7}$ and $\frac{\sqrt{2}}{2}$.



In the above figure, the points F and E represents the $\frac{\sqrt{21}}{7}$ and $\frac{\sqrt{2}}{2}$ respectively. If we take initial guess as point K which is between these two points then there are infinitely many open intervals of points attracted to -1.