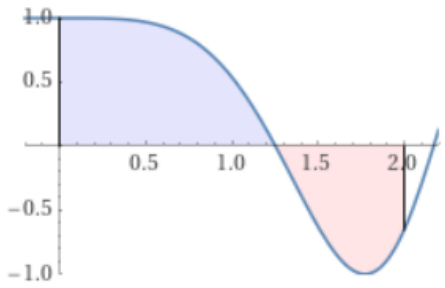
We will try to estimate the definite integral

$$\int_0^2 \cos(x^2)\,dx$$

I do not know how to do it by hand exactly. (*Feel free to try?*) However, we can graph the function $y = \cos(x^2)$. Eyeballing the graph at right, the area above the axis is about 1 and the area below is about 1/2, so we expect a final integral of about 1/2.



1. Write down the Midpoint Rule M_4 for this integral, with $n = 4$ subintervals. (*What are the values of* Δx *and the points* m_i*?*)

2. Use a calculator to evaluate M_4. Round your estimate to 4 decimal places.

3. Write down the Trapezoid Rule T_4 for this integral, with $n = 4$ subintervals. (*What are the values of* Δx *and the points* x_i*?*)

4. Use a calculator to evaluate T_4. Round your estimate to 4 decimal places.

5. Write down Simpson's Rule S_4 for this integral, with $n = 4$ subintervals. (*What are the values of* Δx *and the points* x_i*?*)

6. Use a calculator to evaluate S_4. Round your estimate to 4 decimal places.

7. In Matlab, the command

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>> integral(@(x) cos(x.^2),0,2)
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gives the 0.461461462433216 as an estimate. Using this number as the exact value of the integral, determine the *absolute* error for each of the three estimates M_4, T_4, S_4.