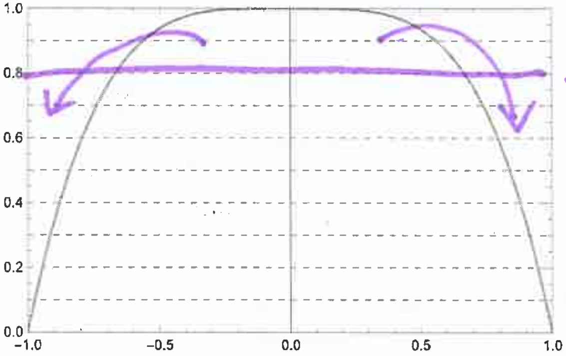
MAT 137 (Calculus II) Prof. Swift

In-class worksheet: Average Value of a Function

The graph of $y = 1 - x^4$ is shown.



1. Compute f_{ave}, the average value of f on $[-1, 1]$.

$a=-1,\ b=1,\ f(x)=1-x^4$

$$f_{ave} = \frac{1}{1-(-1)}\left[\int_{-1}^{1} 1-x^4\,dx\right] = \frac{1}{2}\cdot\left[2\int_0^1 1-x^4\,dx\right] = \int_0^1 1-x^4\,dx$$

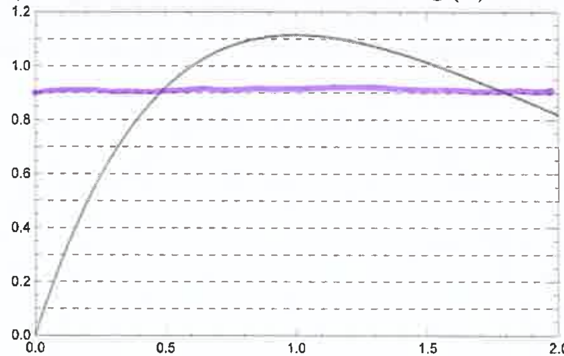
$$= \left(x-\frac{x^5}{5}\right)\Big|_0^1 = 1-\frac{1}{5}-0 = \boxed{\frac{4}{5}} = \boxed{0.8}$$

2. Draw a horizontal line at $y = f_{ave}$. That height is the "cut-fill" height of the graph. Alternatively, the rectangle with width 2 and height f_{ave} has the same area as the area under $y = f(x)$ with $-1 \le x \le 1$.

The graph of $y = g(x)$ is shown, but the formula for $g(x)$ is a secret.

1.0 is too big →

0.8 is too small →



← $g_{ave} = 0.9$

3. One of the horizontal dashed lines is $y = g_{ave}$, the average value of g on $[0, 2]$. You can "eyeball" that height. Draw the horizontal line $y = g_{ave}$.

4. Estimate $\int_0^2 g(x)dx$. Hint: Plug the estimated value of g_{ave} into the formula for g_{ave}, and solve for $\int_0^2 g(x)dx$

$$g_{ave} = \frac{1}{2-0} \int_0^2 g(x)dx$$

$$0.9 = \frac{1}{2} \int_0^2 g(x)dx, \quad \text{so} \int_0^2 g(x)dx = 2 \cdot (0.9) = \boxed{1.8}$$