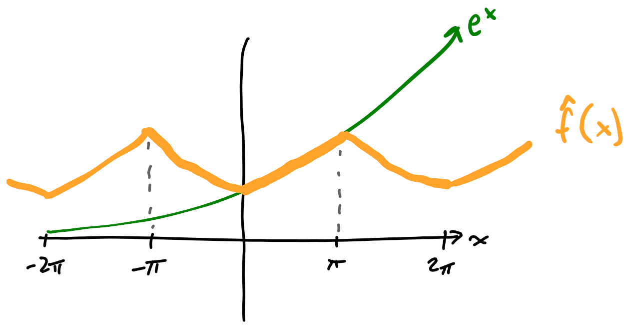
5. Let $\hat{f}(x)$ be the 2π-periodic even extension of e^x. Sketch $\hat{f}(x)$.



6. Compute the Fourier series of $\hat{f}(x)$. Plot some partial sums of this Fourier series.

$$a_k = \frac{2}{\pi}\int_0^{\pi} \underbrace{f(x)}_{e^x} \cos(kx)\,dx$$

$$\hat{f}(x) = \frac{a_0}{2} + \sum_{k=1}^{\infty} a_k \cos(kx)$$

7. What happens if you differentiate the Fourier series for $\hat{f}(x)$ term by term to obtain $\hat{f}'(x)$? Plot some partial sums of $\hat{f}'(x)$.

$$\hat{f}'(x) \stackrel{?}{=} 0 + \sum_{k=1}^{\infty} -a_k \cdot k \sin(kx)$$

This is the odd 2π-periodic extension of e^x.

differentiate

8. What happens if you differentiate the Fourier series for $\hat{f}'(x)$ term by term to obtain $\hat{f}''(x)$? Plot some partial sums of $\hat{f}''(x)$.

$$\hat{f}''(x) \stackrel{?}{=} \sum_{k=1}^{\infty} -a_k \cdot k^2 \cos(kx)$$