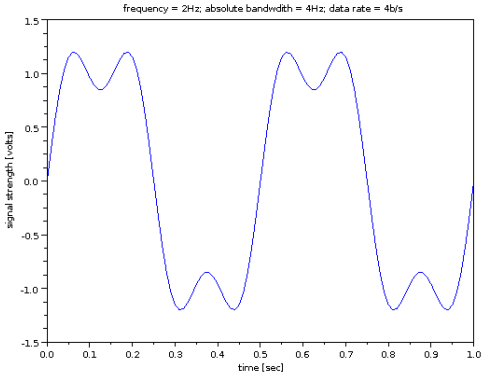
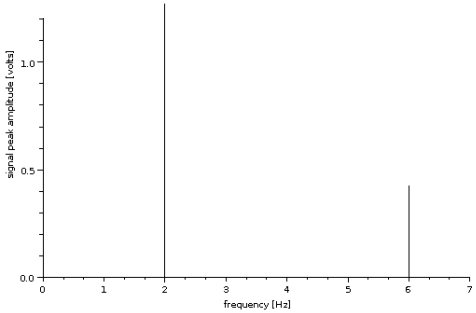
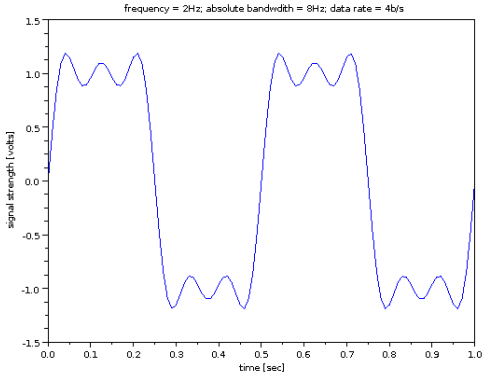
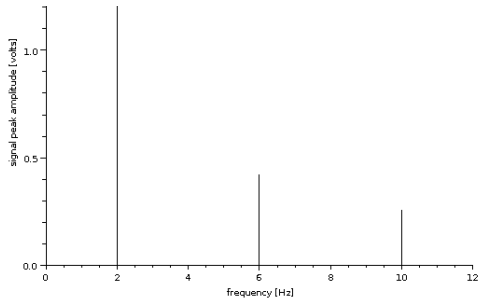


$$s(t)=\frac{4}{\pi}[\sin(4\pi t)+\frac{1}{3}\sin(12\pi t)]$$

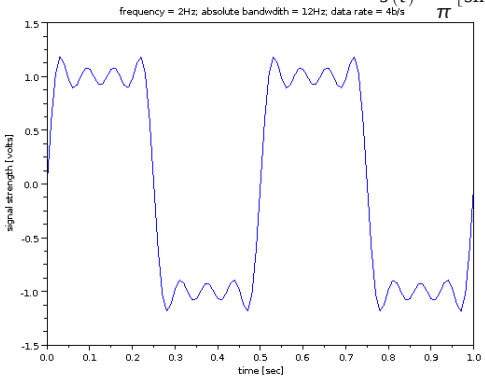


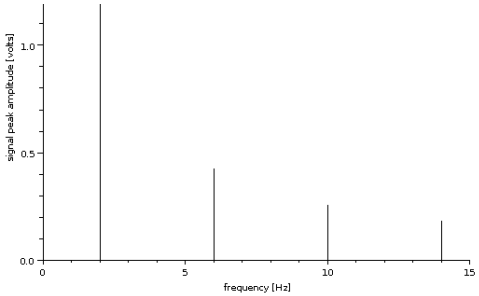


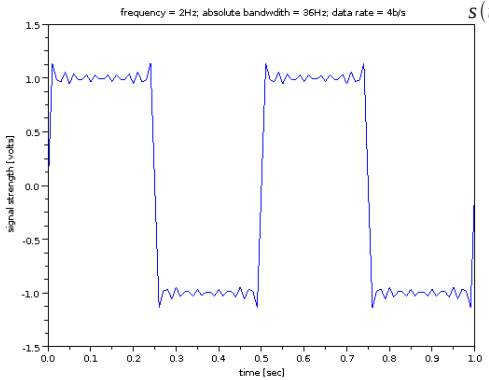
$$s(t)=\frac{4}{\pi}[\sin(4\pi t)+\frac{1}{3}\sin(12\pi t)+\frac{1}{5}\sin(20\pi t)]$$



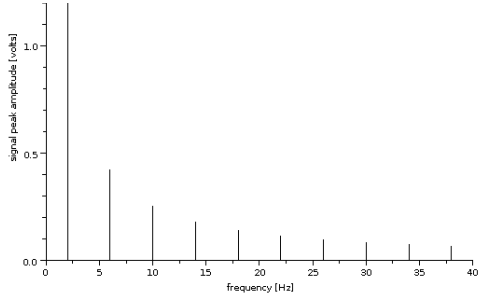
$$s(t)=\frac{4}{\pi}[\sin(4\pi t)+\frac{1}{3}\sin(12\pi t)+\frac{1}{5}\sin(20\pi t)+\frac{1}{7}\sin(28\pi t)]$$

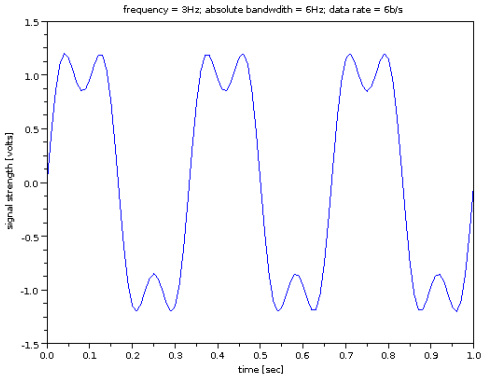




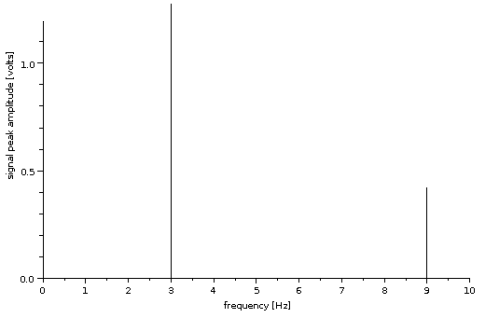


$$s(t)=\frac{4}{\pi}[\sin(4\pi t)+\frac{1}{3}\sin(12\pi t)+\ldots+\frac{1}{19}\sin(76\pi t)]$$





$$s(t) = \frac{4}{\pi}\left[\sin(6\pi t) + \frac{1}{3}\sin(18\pi t)\right]$$



Summary

- Advantages
  - Increased bandwidth → increased accuracy (less errors)
  - Increased frequency → increased data rate
- Disadvantages
  - Increased bandwidth → increased cost
  - Increased frequency → increased complexity (cost)

- Different frequencies have different characteristics
- A standard/regulation normally limits available frequency and bandwidth
  - A designer chooses a signal that maximizes data rate, minimizes errors and minimizes cost