NUMERICAL INTERPOLATION:

1) Given a set of points sitting on curve $y = f(x)$ - expressed as two numpy arrays:

```
x = np.array([-2.26360847, -2.16610699, -2.02469678, -1.71540778,
-1.15546749,-0.29414176, -0.07786256,  0.96114056,  1.07781797,
2.03309523])
```

```
  y = np.array([-0.04449367, -0.05933075, -0.08624049, -0.1637272,
  -0.31774732, -0.86110902, -0.98839902,  0.32224765,  0.44245256,
0.18490792])
```

Estimate the value of y at point $x = 0.16$

Given that the analytic form of $f(x) = (x^3 + x^2 - 1)e^{-x^2}$, check how well each interpolation method (or 'kind') matches the actual value at x = 0.16, and in general along entire region from -2.26 to 2.0 by plotting the analytic form and 'interpolating function'

NUMERICAL INTEGRATION:

1) Perform definite integral:

$$\int_{-1}^{1} e^{-x^2} dx$$

using

a) integrate.quad
b) integrate.trapezoidal

2) Determine the indefinite integral over a range $x \in [0,2\pi]$ and plot the result.

$$\int sin(\bar{x})d\bar{x} = cos(x)$$

Check it looks like a cosine function!

3) Perform the indefinite integral over the range $x \in (-1,1)$:

$$\int \frac{dx}{\sqrt{1 - x^2}}$$

and plot the result. What is the indefinite integral?