Homework 7: Z-Transforms

1. Consider the following discrete-time signal:

\[ x[n] = (0.5)^n u[n] \]

Find the Z-transform \( Y(z) \) and its region of convergence for:

(a) \( y[n] = x[n] \)
(b) \( y[n] = x[n - 10] \)
(c) \( y[n] = x[n]e^{j0.3\pi n} \)
(d) \( y[n] = x[n] \sin(0.1\pi n) \)
(e) \( y[n] = x[n] * \delta[n - 10] \)

2. Find the Z-Transforms and ROC of:

(a) \( x[n] = (-0.1)^{n-5} u[n - 5] \)
(b) \( x[n] = \delta[n - 10] \)
(c) \( x[n] = e^{j0.3\pi n} u[n] \)
(d) \( x[n] = \cos(0.3\pi n) u[n] \)
(e) \( x[n] = e^{j0.3\pi n} \cos(0.3\pi n) u[n] \)