In [4]:
```
import numpy as np
import matplotlib.pyplot as plt

%matplotlib inline
```

Define Inverse CDF Functions

Define the inverse CDF functions for the Logistic, Rayleigh, and Exponential distributions.

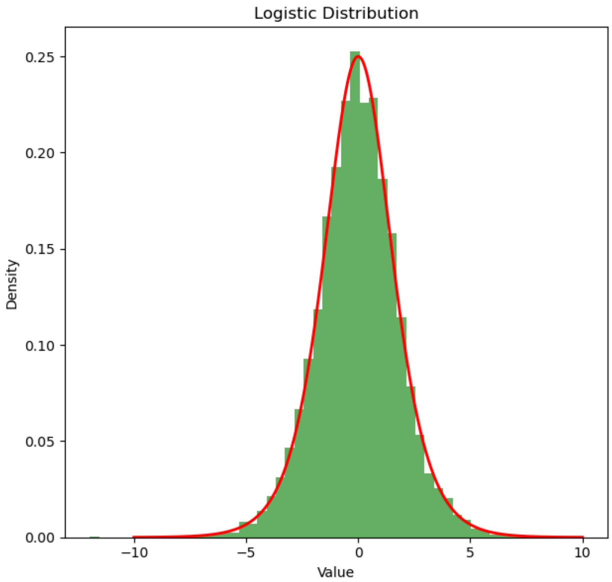
In [5]:
```
def inverse_cdf_logistic(u):
    """Inverse CDF for the Logistic distribution."""
    return np.log(u / (1 - u))

def inverse_cdf_rayleigh(u):
    """Inverse CDF for the Rayleigh distribution."""
    return np.sqrt(-2 * np.log(1 - u))

def inverse_cdf_exponential(u):
    """Inverse CDF for the Exponential distribution."""
    return -np.log(1 - u)
```

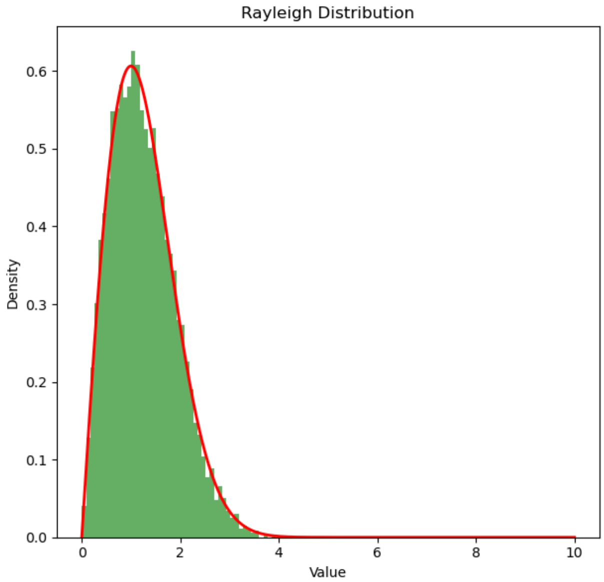
Generate Samples

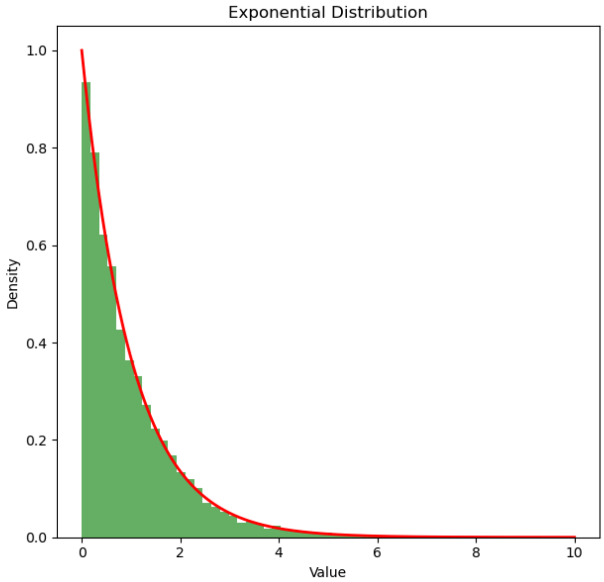
Use the inverse CDF functions to generate samples from each distribution.

In [6]:
```
num_samples = 10000

uniform_samples = np.random.uniform(0, 1, num_samples)

logistic_samples = inverse_cdf_logistic(uniform_samples)
rayleigh_samples = inverse_cdf_rayleigh(uniform_samples)
exponential_samples = inverse_cdf_exponential(uniform_samples)

fig, axs = plt.subplots(3, 2, figsize=(12, 18))

axs[0, 0].hist(logistic_samples, bins=50, density=True, alpha=0.6, color=
x = np.linspace(-10, 10, 1000)
pdf_logistic = np.exp(x) / (1 + np.exp(x))**2
axs[0, 0].plot(x, pdf_logistic, 'r', lw=2)
axs[0, 0].set_title('Logistic Distribution')

axs[1, 0].hist(rayleigh_samples, bins=50, density=True, alpha=0.6, color=
x = np.linspace(0, 10, 1000)
pdf_rayleigh = x * np.exp(-x**2 / 2)
axs[1, 0].plot(x, pdf_rayleigh, 'r', lw=2)
axs[1, 0].set_title('Rayleigh Distribution')

axs[2, 0].hist(exponential_samples, bins=50, density=True, alpha=0.6, col
x = np.linspace(0, 10, 1000)
pdf_exponential = np.exp(-x)
axs[2, 0].plot(x, pdf_exponential, 'r', lw=2)
```

```
axs[2, 0].set_title('Exponential Distribution')

for ax in axs.flat:
    ax.set(xlabel='Value', ylabel='Density')

for i in range(3):
    axs[i, 1].axis('off')

plt.tight_layout()
plt.show()
```


Logistic Distribution
Density
Value
0.00
0.05
0.10
0.15
0.20
0.25
−10
−5
0
5
10


Rayleigh Distribution
Density
Value
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0
2
4
6
8
10


Exponential Distribution
Density
Value
0.0
0.2
0.4
0.6
0.8
1.0
0
2
4
6
8
10