Answers and Explanations: Probability and Distributions (Questions 1–5)

1. Distribution of X:
Given: f(x) = 4x^2 * e^(-2x), for x > 0
This matches the Gamma distribution: shape = 3, rate = 2
Answer: Gamma(3, 2)

2. Probability X <= 6:
PMF is piecewise:
From 0 to 5: ∫(1/25)x dx = (1/25)*(25/2) = 0.5
From 5 to 6: ∫(2/5 - 1/25x) dx = area = 9/50
Total: 0.5 + 9/50 = 17/25
Answer: 17/25

3. Exponential Distribution:
P(X > x) = e^(-lambda * x)
For x = 1: P(X > 1) = e^(-lambda)
Answer: e^(-lambda)

4. Normal Distribution:
P(|X| < 2) ≈ 0.9545
P(X > 2) = (1 - 0.9545)/2 = 0.02275
Answer: 0.02275

5. Find constant c:
f(x) = c*e^x for x in [0,1] and c*e^(-x+2) for x > 1
Integrals: ∫0^1 c*e^x dx = c(e - 1), ∫1^∞ c*e^(-x+2) dx = c*e
Total area = c(e - 1 + e) = 1, so c = 1 / (2e - 1)
Answer: 1/(2e - 1)