

1. (16 points). Consider a function with CDF, $F(x) = 1 - e^{-\frac{x^3}{3}}$, for $0 < x < \infty$

a. (4 Points) Find the PDF for this random variable.

$$f(x) = \frac{d}{dx} F(x) = x^2 e^{-\frac{x^3}{3}} \quad 0 < x < \infty$$

b. (4 Points) Find the SF for this random variable.

$$S(x) = 1 - F(x) = e^{-\frac{x^3}{3}} \quad 0 < x < \infty$$

c. (4 Points) Find the HF for this random variable.

$$h(x) = \frac{f(x)}{S(x)} = \frac{x^2 e^{-\frac{x^3}{3}}}{e^{-\frac{x^3}{3}}} = x^2 \quad 0 < x < \infty$$

2. (5 Points) What is the probability that the next occurrence of the random variable will take on a value between 2 and 5?

$$F(5) - F(2) = 1 - e^{-\frac{5^3}{3}} - (1 - e^{-\frac{2^3}{3}})$$

$$= 0.06948$$

3. (4 Points) Consider a function with CDF, $F(x) = 1 - e^{-\frac{x^3}{b}}$, for $0 < x < \infty$. For what value of parameter b will this distribution have a median of 1.562

$$\text{Solve } F(1.562) = .5 \text{ for } b$$

$$\Rightarrow b = 5.498.$$

3. (3 Extra Credit Points) What is the area under the curve from 1c.? Sketch the curve and describe what real world thing it could represent (ie, define the random Variable X).

area = ∞ , as all hazard
function.

real world - any IFR
type system, car tires,
computer wear + tear.

