

MS 120 PDF Extra Problems

Round to 6 decimal places.

1. (a) Is the following a pdf (probability density function)?

$$f(x) = x + 1; x \in [-1, 1]$$

(b) If $f(x)$ in (a) is not a pdf, can we modify it to make it into one?

(c) If either (a) or (b) is yes, find:

i. $\Pr(-0.5 \leq X \leq 0.5) =$

ii. $\Pr(-1 \leq X \leq 0.75) =$

iii. $\Pr(0.75 \leq X \leq 2) =$

2. (a) Is the following a pdf (probability density function)?

$$f(x) = 3x^2; x \in [0, 4]$$

(b) If $f(x)$ in (a) is not a pdf, can we modify it to make it into one?

(c) If either (a) or (b) is yes, find:

i. $\Pr(0 \leq X \leq 3) =$

ii. $\Pr(3 \leq X \leq 4) =$

iii. $\Pr(0.25 \leq X \leq 2.7) =$

3. (a) Is the following a pdf (probability density function)?

$$f(x) = \begin{cases} 2x & , 0 \leq x \leq 3 \\ -6x + 24 & , 3 < x \leq 4 \end{cases}; x \in [0, 4]$$

(b) If $f(x)$ in (a) is not a pdf, can we modify it to make it into one?

(c) If either (a) or (b) is yes, find:

i. $\Pr(0 \leq X \leq 3) =$

ii. $\Pr(3 \leq X \leq 4) =$

iii. $\Pr(2.5 \leq X \leq 3.5) =$

4. (a) Is the following a pdf (probability density function)?

$$f(x) = -x + 5; x \in [0, 5]$$

(b) If $f(x)$ in (a) is not a pdf, can we modify it to make it into one?

(c) If either (a) or (b) is yes, find:

i. $\Pr(0 \leq X \leq 3) =$

ii. $\Pr(3 \leq X \leq 5) =$

iii. $\Pr(1 \leq X \leq 2) =$

5. (a) Is the following a pdf (probability density function)?

$$f(x) = x^3; x \in [-1, 3]$$

(b) If $f(x)$ in (a) is not a pdf, can we modify it to make it into one?

(c) If either (a) or (b) is yes, find:

i. $\Pr(-1 \leq X \leq 2) =$

ii. $\Pr(2 \leq X \leq 3) =$

iii. $\Pr(-0.5 \leq X \leq 1.25) =$

MS 120 PDF Extra Problems Answers

1. (a) No, because the integral is $2 \neq 1$.

(b)

$$g(x) = (x + 1)/2; x \in [-1, 1]$$

- (c) i. $\Pr(-0.5 \leq X \leq 0.5) = 0.500000$

ii. $\Pr(-1 \leq X \leq 0.75) = 0.765625$

iii. $\Pr(0.75 \leq X \leq 2) = 0.234375$

2. (a) No, because the integral is $64 \neq 1$.

(b)

$$f(x) = \frac{3}{64}x^2; x \in [0, 4]$$

- (c) i. $\Pr(0 \leq X \leq 3) = 0.421875$

ii. $\Pr(3 \leq X \leq 4) = 0.578125$

iii. $\Pr(0.25 \leq X \leq 2.7) = 0.307303$

3. (a) No, because the integral is $12 \neq 1$.

(b)

$$f(x) = \begin{cases} \frac{1}{6}x & , 0 \leq x \leq 3 \\ -\frac{1}{2}x + 2 & , 3 < x \leq 4 \end{cases}; x \in [0, 4]$$

- (c) i. $\Pr(0 \leq X \leq 3) = 0.75$

ii. $\Pr(3 \leq X \leq 4) = 0.25$

iii. $\Pr(2.5 \leq X \leq 3.5) = 0.416667$

4. (a) No, because the integral is $\frac{25}{2} \neq 1$.

(b)

$$f(x) = -\frac{2}{25}x + \frac{2}{5}; x \in [0, 5]$$

- (c) If either (a) or (b) is yes, find:

i. $\Pr(0 \leq X \leq 3) = 0.84$

ii. $\Pr(3 \leq X \leq 5) = 0.16$

iii. $\Pr(1 \leq X \leq 2) = 0.28$

5. (a) No, because $f(-1) = -1 < 0$.

(b) No.

- (c) If either (a) or (b) is yes, find:

i. $\Pr(-1 \leq X \leq 2) = \text{DNE}$

ii. $\Pr(2 \leq X \leq 3) = \text{DNE}$

iii. $\Pr(-0.5 \leq X \leq 1.25) = \text{DNE}$