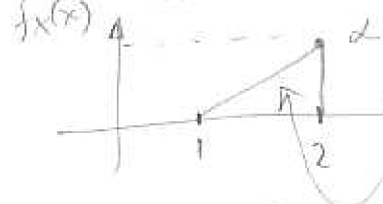
ECEN4503 Quiz #3 4 February 2011 Name Solution

1) A random variable X has a PDF of the form $f_X(x) = \alpha(x-1)$; $1 \le x \le 2$. The PDF = zero outside these bounds.

1a [2] **Compute** α.

1b [2] **Compute** $P(X > 1.2)$

1c [2] **Compute** $E[X]$.



$\Rightarrow \alpha = 2$ ANS

$$P(X>1.2) = \int_{1.2}^{2} (2x-2)\,dx = x^2 - 2x \Big|_{1.2}^{2} = (4-4) - (1.2^2 - 2.4) = \underline{0.96} \text{ ANS}$$

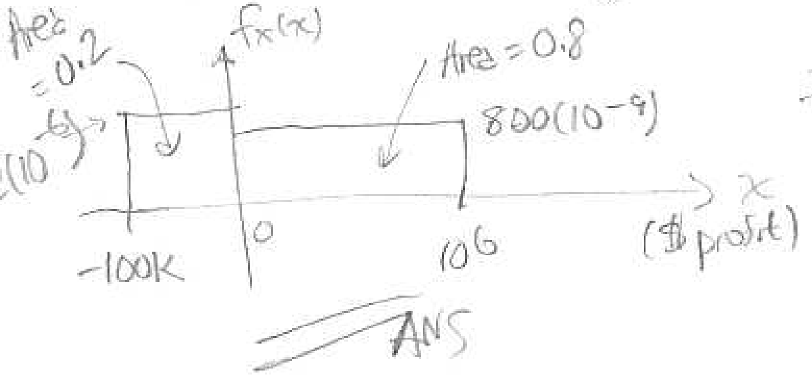
$$E[X] = \int_1^2 x \cdot f_X(x)\,dx = \int_1^2 (2x^2 - 2x)\,dx = \frac{2x^3}{3} - x^2 \Big|_1^2 = \left(\frac{16}{3} - 4\right) - \left(\frac{2}{3} - 1\right)$$

$$= \frac{4}{3} + \frac{1}{3} = \underline{5/3} \text{ ANS}$$

2) A company brings a new product to market. According to its marketing projections, the P(making a profit) = 0.8, and the P(losing money) = 0.2. The projected profit is equally likely to be anywhere between \$0 and \$1,000,000, while the projected loss is equally likely to be anywhere between \$0 and \$100,000. Define X = profit in dollars. Treat a loss as a negative profit.

2a [2] Sketch $f_X(x)$

2b [2] Sketch the conditional PDF $f_X(x \mid x > 0)$.



$\Rightarrow$ Toss unneeded area (Region where $X < 0$). Normalize.