ECE 302 Quiz 3
(10 points)

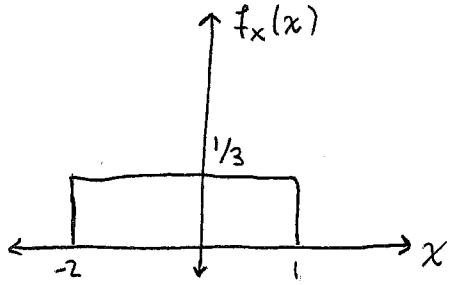
Name: Solution (3 points) 07/11/2016

1. Let X be a uniform random variable on [-2,1]. Find the following expectations. **Show all work.**

   (a) (1 point) $\mathbb{E}[X]$

   (b) (3 points) $\mathbb{E}[2X^3 + 4X - 1]$

   (c) (3 points) $\mathbb{E}[X^3 \,|\, |X| > 1]$



(a) $E[X] = \frac{-2+1}{2} = \boxed{-1/2}$, from notes

(b) $E[2X^3 + 4X - 1] = 2E[X^3] + 4E[X] - 1$

$E[X^3] = \int_{-2}^{1} x^3 \cdot \frac{1}{3}\, dx = -5/4$

$\Rightarrow E[2X^3 + 4X - 1] = 2 \cdot (-5/4) + 4 \cdot (-1/2) - 1$

$= \boxed{-11/2}$

(c) $f_X(x \,|\, |X|>1) = \dfrac{f_X(x)\, 1_{|x|>1}(x)}{Pr(|X|>1)} = \begin{cases} 1, & -2 \le x < -1 \\ 0, & \text{else} \end{cases}$

$\Rightarrow f_X(x \,|\, |X|>1)$ is uniform pdf on $[-2, 1)$

$E[X^3 \,||X|>1] = \int_{-2}^{-1} x^3\, dx = \frac{1}{4}x^4 \Big|_{-2}^{-1} = \frac{1}{4} - 4 = \boxed{-15/4}$