True/False - No explanation needed. (1pt for correct, 0pt - no answer, -1pt - incorrect)

1. If the standard deviation exists, the mean exists. True/False
   True. This is the reverse version of the statement "if the mean does not exist, the variance/std does not either".

2. If a RV X is translated by 2, i.e. $X + 2$, its standard deviation is also translated by 2. True/False
   False. Std is not translated.

Problems - Need justification. No justification means **zero**!

1. (10pts) Given a RV X having the PDF $f(x) = cx(1 - x)$ for $0 \leq x \leq 2$ and $f(x) = 0$ otherwise. Find the variance of X (in term of c).

$$\mu = \int_{-\infty}^{\infty} x f(x)dx = \int_{0}^{2} cx^2(1 - x)dx = c\left(\frac{x^3}{3} - \frac{x^4}{4}\right)\Big|_{0}^{2} = -\frac{4c}{3}$$

$$\sigma^2 = \int_{-\infty}^{\infty} (x - \mu)^2 f(x)dx = \int_{-\infty}^{\infty} x^2 f(x)dx - \mu^2 = \int_{0}^{2} x^3 c(1 - x)dx - \mu^2 = c\left(\frac{x^4}{4} - \frac{x^5}{5}\right)\Big|_{0}^{2} -$$

$$\left(-\frac{4c}{3}\right)^2 = -\frac{12c}{5} - \frac{81c^2}{16}$$

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