11. [8 points] The parts of this problem are unrelated. No justification is required for your answers.
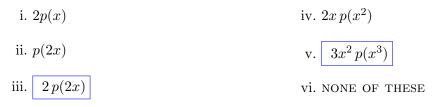
a. [2 points] Let $p(x)$ be a probability density function (pdf). Then, which of the following functions must also be probability density function? Circle **all** options which apply.

    i. $2p(x)$

    ii. $p(2x)$

    iii. $\boxed{2\,p(2x)}$

    iv. $2x\,p(x^2)$

    v. $\boxed{3x^2\,p(x^3)}$

    vi. NONE OF THESE

b. [2 points] The cartesian coordinates of a point A are $(x,y) = (\sqrt{2}, -\sqrt{2})$. Which of the following represent the polar coordinates of point A? Circle **all** options which apply.

    i. $(r,\theta) = \left(\sqrt{2}, -\dfrac{\pi}{4}\right)$

    ii. $\boxed{(r,\theta) = \left(2, -\dfrac{\pi}{4}\right)}$

    iii. $\boxed{(r,\theta) = \left(2, \dfrac{7\pi}{4}\right)}$

    iv. $(r,\theta) = \left(-2, \dfrac{\pi}{4}\right)$

    v. $\boxed{(r,\theta) = \left(-2, \dfrac{3\pi}{4}\right)}$

    vi. NONE OF THESE

c. [2 points] A power series $\displaystyle\sum_{n=0}^{\infty} C_n(x-a)^n$ converges at $x = -4$ and diverges at $x = 2$. Which of the following values could be the center, a, of the power series? Circle **all** options which apply.

    i. $\boxed{a = -2}$

    ii. $\boxed{a = -1}$

    iii. $a = 0$

    iv. $a = 1$

    v. $a = 2$

    vi. NONE OF THESE

d. [2 points] At which of the following values of θ in $[0, \pi)$ does the curve $r = \cos(\theta)$ have a horizontal tangent line? Circle **all** options which apply.

    i. $\theta = 0$

    ii. $\boxed{\theta = \dfrac{\pi}{4}}$

    iii. $\theta = \dfrac{\pi}{3}$

    iv. $\theta = \dfrac{\pi}{2}$

    v. $\boxed{\theta = \dfrac{3\pi}{4}}$

    vi. NONE OF THESE