Problem 1. (5 points.) Potential energy is related to the mass, the altitude of the body and gravity ($9.8 \text{ m s}^{-2}$) by the following expression: $E_p = mgh$. By dimensional analysis, potential energy is measured in: (Show work).

1. Newtons ($\text{kg m s}^{-2}$)
2. Joules ($\text{kg m}^2 \text{s}^{-2}$)
3. Pascal ($\text{kg m}^{-2} \text{s}^{-2}$)

Problem 2. (5 points.) In the following figure, which vector has the longest magnitude? Vector A (2,4) or Vector B (-4,2). Explain.
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3. Pascal (kg m\(^{-2}\) s\(^{-2}\))

Solution:

\[
E_p = mgh \\
= [kg][ms^{-2}][m] \\
= [kgm^2s^{-2}] \\
= Newtons
\]

Problem 2. (5 points.) In the following figure, which vector has the longest magnitude? Vector A (2,4) or Vector B (-4,2). Explain.

Solution: Magnitude of vector A:

\[
|A| = \sqrt{(2)^2 + (4)^2} = \sqrt{4 + 16} = \sqrt{20} \approx 4.47
\]

Magnitude of vector B:

\[
|B| = \sqrt{(-4)^2 + (2)^2} = \sqrt{16 + 4} = \sqrt{20} \approx 4.47
\]

Both vectors have the same magnitude.