Midterm 2 / 2019.3.29 / MAT 2233.001 / Linear Algebra

Name: _____

Please show all work. Check your answers! ◡̈

1. Let $A = \begin{bmatrix} 1 & 1 & 1 \\ 1 & 2 & 3 \\ 1 & 3 & 5 \end{bmatrix}$.
   (a) Find a basis for the kernel of A.
   (b) Find a basis for the image of A.
   (c) Describe and sketch the kernel and the image of A.
2. Let $A = \begin{bmatrix} 3 & 4 \\ 4 & 3 \end{bmatrix}$, $u = \begin{bmatrix} 1 \\ 2 \end{bmatrix}$, $v = \begin{bmatrix} 1 \\ 1 \end{bmatrix}$.
   (a) Explain why u and v form a basis for the plane $\mathbf{R}^2$.
   (b) Express Au as a linear combination of u and v. Same for Av.
   (c) What matrix represents the linear map $x \mapsto Ax$ with respect to the u, v basis?
3. Let P be the vector space of polynomials and let $c > 0$. Explain why the following subsets H of P are subspaces of P.
   (a) $H = \{p(t)\colon p(c) = 0\}$.
   (b) $H = \left\{p(t)\colon \int_0^c p(t)\,dt = 0\right\}$.

1	2	3	total (30)