

NAME:

PID:

Section:

MIDTERM 1 MATH 103A Winter 2019

1. You have 50 minutes. **No** calculators, phones, books and notes allowed, except for one cheat sheet.
 2. Write your solutions in the provided spaces. Show your work and justify your answers.
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1. Find integers s and t such that $1 = 5s + 13t$. Show that s and t are not unique.
 2. Calculate $2^{1207} \bmod 15$. Justify your answer.
 3. Consider the group \mathbb{Z}_{24} .
 - (a) Find all the generators of \mathbb{Z}_{24} . (*Hint*: To save some time, you may use that $\gcd(24 - j, 24) = \gcd(j, 24)$. E.g. $\gcd(17, 24) = \gcd(7, 24)$.)
 - (a) Find all elements of order 6 in \mathbb{Z}_{24} .
 4. Find all subgroups of $U(9)$. Give a reason why the subgroups you have found are all there are.
 5. Let G be a cyclic group of order 18, and let a be a generator of G . What is the order of $\langle a^{15} \rangle \cap \langle a^{10} \rangle$? Justify your answer!