MATH 205 L01 Winter 2002 Midterm 50 Minutes

N	JAME:ID:
	No Calculators
1.	For each question answer T or F only. [20]
	(a) The work of René Descartes had great influence towards unifying the mathematics of his time.
	(b) Grecian mathematics was far more on the theoretical side than the applied side.
	(c) Calculus was one of the great discoveries of Grecian mathematics
	(d) Probability theory originated with the work of Hindu and Arabic mathematicians in the period 400-900 AD.
	(e) Algebra originated with the work of Hindu and Arabic mathematicians in the period 400-900 AD.
	(f) Chinese mathematicians around 400 AD already knew the value of π to about 6 digits.
	(g) Greek mathematicians not only knew the Earth was round but also calculated its size.
	(h) Leonhard Euler was the most famous Italian mathematician during the 1700's
	(i) Sophie Germain, in the period 1810-1830, was the first notable female mathematician.
	(j) Prime numbers of the form $2^n - 1$ (where n is itself a prime) are named after the Frenchman Pierre de Fermat.

2. To 3 decimal place accuracy it is true that $\sqrt{2}=1.414$. Explain, in one to two sentences, whether the statment $\sqrt{2}=1.41414141...$ is true or false. [20]

False

because $\sqrt{2} \notin \mathbb{Q}$, whereas $1.\overline{41} \in \mathbb{Q}$

3. (a) In base 3, find 1202 + 2211.

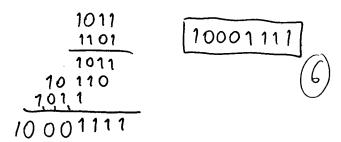
[20]

$$= 11120$$

$$= 11120$$

$$= 6$$

 $\mathcal{J}(b)$ In base 2, find 1011×1101 .



(c) Write the base 10 number 5,376 as a Mayan number.

4. (a) In
$$\mathbb{Z}_{23}$$
, find $16(3^2 + 4^2)$.

[20]

$$= 16 \times 2 = \boxed{9}$$

(b) In
$$\mathbb{Z}_{23}$$
, find 7^{-1} .

$$7^{-1} = 10$$

(c) If 28^{2244} is divided by 23, what is the remainder?

$$28^{2244} = 5^{2244}$$
 in \mathbb{Z}_{23}

in
$$Z_{23}$$

$$=5^{\circ}$$

$$=11$$

= 5° by Fermit's Little Theorem, since $5^{22} = 1$ = 1



5. (a) Find the greatest common divisor gcd(182, 403).

[20]

$$\begin{array}{r}
2 \\
182)403 \\
\underline{364} \quad 4 \\
\hline
39)182 \\
\underline{156} \quad 1 \\
26 \quad 2 \\
\hline
13)26 \\
\underline{26} \quad 2 \\
\hline
0
\end{array}$$

(b) Using (a) explain why the Diophantine equation

$$182x + 403y = 26,005$$

can have no solution (in integers).

Reason $|3 \nmid 26,005$ (clearly $|3 \mid 26,000$, hence $|26,005 \equiv 5 \pmod{13}$)