Mathematics 174 Test #2

Name:

Show your work to get credit. An answer with no work will not get credit.

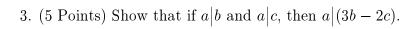
1. (25 Points) Evaluate the following

(a) 27 div 4

- (b) $-32 \, div 7$
- (c) $41 \mod 11$

(d) $-43 \ mod \ 13$

- (e) $\sum_{k=2}^{5} (2k^2 + 3)$
- (f) $\prod_{m=0}^{5} \frac{2m-1}{2m+1}$
- (g) [5.48]
- (h) [-17/3]
- 2. (5 Points) Today is a Friday. What day of the week will it be 120 days from now?



4. (5 Points) Show that the square of any integer is either of the form
$$4k$$
 or $4k + 1$.

5. (5 Points) If
$$n = 6k + 1$$
 show that 12 divides $n^2 - 1$.

6. (5 Points) If
$$n \mod 3 = 2$$
 then show $\left\lceil \frac{n}{3} \right\rceil = \frac{n+1}{3}$.

7. (5 Points) What is a formula for the general term
$$a_k$$
 of the sequence that starts

$$\frac{3}{5}$$
, $\frac{-5}{7}$, $\frac{7}{9}$, $\frac{-9}{11}$, $\frac{11}{13}$, ...

9.	(5 Points) Either prove or give a counterexample to the stateme	nt "the square of an irrational
	number is irrational".	

10. (10 Points) Write the following using summation or product notation. (a) $1^3 - 2^3 + 3^3 - 4^3 + 5^3 - 6^3$

(a)
$$1^3 - 2^3 + 3^3 - 4^3 + 5^3 - 6^3$$

(b)
$$1 \cdot 3 \cdot 5 \cdot 7 \cdot 9 \cdot 11 \cdot 13 \cdot 15$$
.

11. (10 Points) Let $A=\{b,c,d,f,g\},$ $B=\{a,b,c\}$ and $C=\{a,f\}$ the find the following

(a)
$$A - B - C$$

(b)
$$B - (A \cup B)$$

12. (10 Points) Draw the Venn diagrams for the following (a) $A \cup (B \cap C)$

(b)
$$A^{c} - (B \cup C)$$

13. (5 points) Prove by induction that for $n \ge 0$ $1 + r + r^2 + \cdots + r^n = \frac{1 - r^{n+1}}{1 - r}$.