Instructions

- Write all answers in capital letters in the spaces provided on the next page!
- Do not remove this answer sheet from the rest of the exam.
- All problems are worth the same amount.
- Problems marked with (EC) are extra credit.
- There is no penalty for guessing however no credit will be given unless some work is shown (a single line of work is enough)
- Problems marked with (*) are those where partial credit will be given if it is clear from the work that you understand how to do the problem but you choose the wrong answer.
- Good Luck!

Math 170

Make Up Final Exam

December 10, 2000

Name _____ Section Number _____

(*) 1. _____ (*)9. _____

2. _____ 10. _____

(*) 3. _____ 11. _____

(*) 4. _____ 12. _____

(*) 5. _____ 13. _____

6. _____ 14. _____

(*) 7. _____ 15. _____

8. _____ 16. _____

(1) Suppose A is a symbol which represents ten? What is $A2A$ base 11 expressed base 5?

(a) 12012 base 5

(b) 11242 base 5

(c) 14432 base 5

(d) 12402 base 5

(e) 11234 base 5

(f) 14321 base 5

(2) What is 1122.12 base 5 expressed base 10?

(a) 152.28 base 10

(b) 162.28 base 10

(c) 261.28 base 10

(d) 152.82 base 10

(e) 162.82 base 10

(f) 261.82 base 10

(3) What is $110.\overline{011}$ base 2 as a fraction (base 10) in lowest terms?

(a) 45/17

(b) 63/17

(c) 55/17

(d) 55/7

(e) 63/7

(f) 45/7

(4) What is $[5; 4, 3, 2, 1]$ expressed as a fraction in lowest terms?

(a) 225/43

(b) 225/53

(c) 225/73

(d) 217/66

(e) 217/77

(f) 217/88

(5) What does $[1; \overline{2, 1}]$ equal?

(a) $\frac{2+\sqrt{5}}{2}$

(b) $\frac{2-\sqrt{5}}{2}$

(c) $\frac{1+\sqrt{3}}{2}$

(d) $\frac{1-\sqrt{3}}{2}$

(e) $\frac{1+\sqrt{5}}{2}$

(f) $\frac{1-\sqrt{5}}{2}$

(6) Which of the following are rational numbers?

(i) $\sqrt{2^2 \cdot 3^3 \cdot 5^5}$

(ii) $\sqrt[3]{2^2 \cdot 7^3 \cdot 13^5}$

(iii) $\sqrt{2^2 \cdot 3^4 \cdot 5^6}$

(iv) $\sqrt[5]{2^5 \cdot 3^{10} \cdot 5^{15}}$

(a) (i) and (iv)

(b) $(i), (iii)$ and (iv)

(c) (ii) and (iv)

(d) (iii) and (iv)

(e) $(i), (ii)$ and (iv)

(f) $(i), (ii), (iii)$ and (iv)

(7) Let $R_{n+1} = 2R_n^2 + 2R_n - 1$ be a mathematical model with $R_0 = 1$. What is R_3?

(a) $R_3 = 1313$

(b) $R_3 = 1203$

(c) $R_3 = 903$

(d) $R_3 = 1103$

(e) $R_3 = 1213$

(f) $R_3 = 1552$

(8) Let $R'_{n+1} = 3(R'_n)^3 - 8R'_n$ be a mathematical model. How many equilibrium points does R'_n have and what are they?

(a) There are 3 equilibria and they are $R_0 = 0,\ R_0 = \sqrt{3}$ and $R_0 = -\sqrt{3}$

(b) There are 3 equilibria and they are $R_0 = 0,\ R_0 = \sqrt{2}$ and $R_0 = -\sqrt{3}$

(c) There are 3 equilibria and they are $R_0 = 0,\ R_0 = \sqrt{2}$ and $R_0 = -\sqrt{3}$

(d) There are 2 equilibria and they are $R_0 = \sqrt{3}$ and $R_0 = -\sqrt{3}$

(e) There are 2 equilibria and they are $R_0 = \sqrt{2}$ and $R_0 = -\sqrt{2}$

(f) There are 3 equilibria and they are $R_0 = 0,\ R_0 = \sqrt{3}$ and $R_0 = -\sqrt{2}$

(9) Consider the mathematical model $M_{n+1} = M_n^2 + (3 + i)$ with $M_0 = 0$. What is M_3?

(a) $75 - 155i$

(b) $85 + 125i$

(c) $95 - 175i$

(d) $95 + 125i$

(e) $85 - 155i$

(f) $75 + 155i$

(10) What are the values of x such that $x^2 + 3x + 1 = 0$?

(a) $x = \frac{3+\sqrt{5}}{2}$, $x = \frac{3-\sqrt{5}}{2}$

(b) $x = \frac{-3+\sqrt{5}}{2}$, $x = \frac{-3-\sqrt{5}}{2}$

(c) $x = -3 + 2i$, $x = -3 - 2i$

(d) $x = \frac{-1+i\sqrt{2}}{2}$, $x = \frac{-1-i\sqrt{2}}{2}$

(e) $x = -3 + i$, $x = -3 - i$

(f) $x = \frac{-3+i}{2}$, $x = \frac{-3+i}{2}$

(11) What does $(3+i)\times(1+2i)$ equal? What about $(3+i)+(1+2i)$?

(a) $(3+i)\times(1+2i)=7+i$, $(3+i)+(1+2i)=4-3i$

(b) $(3+i)\times(1+2i)=1+7i$, $(3+i)+(1+2i)=4+3i$

(c) $(3+i)\times(1+2i)=1-7i$, $(3+i)+(1+2i)=4-3i$

(d) $(3+i)\times(1+2i)=-1+7i$, $(3+i)+(1+2i)=3+4i$

(e) $(3+i)\times(1+2i)=7+7i$, $(3+i)+(1+2i)=4+6i$

(f) $(3+i)\times(1+2i)=7-7i$, $(3+i)+(1+2i)=6+3i$

(12) What does $\frac{3+i}{1+2i}$ equal? What about $(3+i)-(1+2i)$?

(a) $\frac{3+i}{1+2i} = \frac{3+2i}{5}$, $(3+i)-(1+2i) = 2-i$

(b) $\frac{3+i}{1+2i} = 1+i$, $(3+i)-(1+2i) = -2-i$

(c) $\frac{3+i}{1+2i} = \frac{3-2i}{5}$, $(3+i)-(1+2i) = -2+i$

(d) $\frac{3+i}{1+2i} = 1-i$, $(3+i)-(1+2i) = 2-i$

(e) $\frac{3+i}{1+2i} = \frac{2+5i}{10}$, $(3+i)-(1+2i) = 2+i$

(f) $\frac{3+i}{1+2i} = \frac{2-5i}{10}$, $(3+i)-(1+2i) = 2+i$

(13) Let $M_{n+1} = (M_n)^2 + 2$ be a mathematical model. How many real equilibrium points does M_n have? What (if any) are they? How many other complex equilibrium points does M_n have? What (if any) are they?

(a) There are two real roots and no imaginary roots. $x = \frac{3+\sqrt{8}}{2}$, $x = \frac{3-\sqrt{8}}{2}$

(b) There are no real roots and two imaginary roots. $x = \frac{3+i\sqrt{8}}{2}$, $x = \frac{3-i\sqrt{8}}{2}$

(c) There are two real roots and no imaginary roots. $x = \frac{2+\sqrt{6}}{2}$, $x = \frac{2-\sqrt{6}}{2}$

(d) There are no real roots and two imaginary roots. $x = \frac{2+i\sqrt{6}}{2}$, $x = \frac{2-i\sqrt{6}}{2}$

(e) There are two real roots and no imaginary roots. $x = \frac{1+\sqrt{7}}{2}$, $x = \frac{1-\sqrt{7}}{2}$

(f) There are no real roots and two imaginary roots. $x = \frac{1+i\sqrt{7}}{2}$, $x = \frac{1-i\sqrt{7}}{2}$

(14) Let $F_1 = 1$, $F_2 = 1$ and $F_{n+2} = F_{n+1} + F_n$ describe the Fibonacci numbers. What does $F_7 + F_{11}$ equal?

(a) 132

(b) 72

(c) 82

(d) 92

(e) 102

(f) 112