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Introduction to Contemporary Math
MATH 160
Exam 1 – Summer 1998

You must show all relevant work to receive full credit. The point value of each problem is indicated in the left-hand margin.

(6 pts.) 1.(a) Write down the first 6 terms of the Fibonacci sequence.

(b) Write down a formula for the Nth term of the Fibonacci sequence

$F_N =$

(8 pts) 2.(a) What is the golden ratio?

(b) Find the value of x so that the rectangle shown below is a golden rectangle.

(6 pts) 3. Solve the equation $2x^2 = 7x + 3$.

(8 pts) 4. Consider ΔABC. Find x and y so that ΔDEF is a gnomon for ΔABC.

(6 pts) 5. Consider the following sum with 36 terms:

$$\underbrace{2 + 6 + 10 + 14 + \ldots}_{36 \text{ terms}}$$

(a) What is the last term?

(b) Compute the sum.

(8 pts) 6. Consider the following sequence:

$$1, 5, 25, 125, 625, \ldots$$

(a) Find an explicit formula for the Nth term.

(b) Compute $1 + 5 + 25 + 125 + \cdots + 5^{60}$. (Do not simplify your answer. It is okay for it to involve powers of 5.)

(7 pts) 7. How much is in a bank account after 7 years if you invest \$7,000 at 7% compounded daily?

(7 pts) 8. How much should you invest in an account that pays 9% interest compounded quarterly if you want to have \$75,000 in 15 years?

(8 pts) 9. The growth of a certain population of fish in a pond is described by the logistic growth model with growth parameter $r = 3.0$. If the starting population is given by $p_1 = 0.2$, compute:

(a) p_3

(b) The population after 3 transitions.

(8 pts) 10. List the four basic types of rigid motions of the plane.

(8 pts) 11. Consider an equilateral triangle with axes of reflection ℓ_1, ℓ_2, and ℓ_3 as shown in the figure. Let r_1, r_2, and r_3 be the reflections with respect to ℓ_1, ℓ_2, and ℓ_3, respectively. Also, let R_{120} and R_{240} denote the clockwise rotations of $120°$ and $240°$, respectively, about the center. Let I denote the identity motion.

Find the <u>single</u> rigid motion that is equivalent to R_{120} followed by r_2.

(12 pts) 12. Describe completely <u>all</u> symmetries for the following:

(a)

(b)

(c)

(8 pts) 13. The point P' is the image of P under a glide reflection. Find the image of the figure $ABCDE$ under this glide reflection.