Stony Brook University.

MAT 123 — Precalculus, Summer 2011.

Practice Midterm.

NAME: ID:

Question 1. Explain what a function is. Give examples from every-day-life.

Question 2. What are the domain and image of a function? Give examples.

Question 3. When is a function one-to-one? What is the inverse of a function? Give examples.

Question 4. Given the equations below identify if they define y as a function of x. For those which are functions, identify the domain and image.

(a) $3y - \sqrt{x}y + 7 = 0$ (b) $x^{\frac{1}{2}} + y^{\frac{1}{2}} = 1$ (c) $e^y + \frac{1}{x} = 0.$ (d) $\sqrt{x + \ln y} - x = \frac{2}{x+7}$ (e) $5^{y^4} - x^3 = 0$

Question 5. The product of two numbers is equal to 10. Express their difference in terms of one of them.

Question 6. According to the National Center for Health Statistics, in 1990, 28% of babies in the United States were born to parents who were not married. Throughout the 1990s, this percentage increased by approximately 0.6 per year.

(a) Express the percentage of babies born out of wedlock as a function of the number of years after 1990.

(b) If this trend continues, in which year will 40% of babies be born out of wedlock?

Question 7. A rectangular box with a volume of $60ft^3$ has a square base. Find a function which gives its surface area S in terms of the length x of one side of the base.

Question 8. Two ships leave port at the same time. One sails south at $15mi/h$ and the other sails east at $20mi/h$. Find a function that gives the distace D between them in terms of the time t (in hours) since their departure.

Question 9. You have $1200ft$ of fencing to enclose a rectangular region and subdivide it into three rectangular regions by placing two fences parallel to one of the sides. Express the area of the enclosed region as a funcion of one of its dimensions.

Question 10. Given a cylinder with circular base and volume $V = 1m^3$, express its surface area as a function of its height.

Question 11. Graph:

(a) $y = \frac{x^2+1}{x}$ (b) $y = \frac{x^2+x-6}{x-3}$ (c) $y = \frac{x^3-1}{x^2-9}$ (d) $y = \frac{x^2-4x-12}{x^2+4x+3}$ (e) $y = \frac{1}{x^2-7}$.

Question 12. Compute:

(a) $\log_2(16)$ (b) $\ln e^3 + \log \frac{1000}{0.1} - \log_3 81$ (c) $\log_3 \sqrt{3}$ (d) $7^{\log_7 23}$

Question 13. Solve for x:

(a) $125^x = 625$ (b) $5^{2-x} = \frac{1}{25}$ (c) $8^{1-x} = 4^{x+2}$ (d) $\log_3(x-5) + \log_3(x+3) = 2$
(e) $2\log_4(x+5) - \log_4 x - \log_3 9 = 3$ (f) $\log(2x-1) = \log(x+3) + \log 3$

Question 14. Graph:

(a) $y = e^{2x}$ (b) $f(u) = \log_3(u+5)$ (c) $y = \ln x^2 - 1$ (d) $y = -e^{-x}$ (e) $f(s) = \ln \frac{1}{s+2}$

Question 15. Suppose you have \$6,000 to invest. Which investment yields the greater return over 4 years: 8.25% compounded quarterly of 8.3% compounded semiannually?

Question 16. Find the accumulated value of an investment of \$12,000 for 10 years at an interest rate of 7.5% compounded continuously.

Question 17. If it takes 10 years for a radioactive substance to decay by 30% of its value, find its half-life assuming continuous-exponential decay.

Question 18. The half-life of the radioactive element plutonium-239 is 25,000 years. If 16 grams of plutonion-239 are initially present, how many grams are present after 25,000 years? 50,000 years? 100,000 years?

Question 19. If some material contains originally 320 grams of carbon-14, how many grams will it contain after 4,000 years?

Question 20. A radioactive substance decays from 200 grams to 130 grams in 2,000 years. Assuming continuous-exponential decay, determine its half-life. How many years will it take to decay to 80 grams? And how much of the substance will remain after 3,000 years?