MATH 115 - MIDTERM # 2 - NOVEMBER 15, 1995

Fall 95–Sections 27-30 Corso – Jones	Name:

BE NEAT AND SHOW ALL YOUR WORK; CIRCLE YOUR ANSWER

1. If $f(x) = \sqrt{2-x}$ and $g(x) = x^2 + 1$, find

$$f \circ g \ = \ \underline{\qquad\qquad},$$

$$g \circ f \ = \ \underline{\qquad\qquad}.$$

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total: /50

2. Find the domain, vertical and horizontal asymptotes, the x- and y-intercepts, the sign variation and the symmetries of

$$f(x) = \frac{x^2}{1 - x^2}.$$

Sketch the graph of $f(x)$.

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3. Write as a single logarithm

$$\log_2(x+2) + 2\log_2(x-2) - \frac{3}{2}\log_2(x-1).$$

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4. Assume that the formula

$$A(t) = A_0 \left(\frac{1}{2}\right)^{t/15}$$

gives the amount of sugar undissolved in a cup of water after t seconds.

If $40g$ of sugar are initially placed in water, how long will it take for all but $10g$ of sugar to dissolve? How long will it take for all but $5g$ of sugar to dissolve?

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5. Solve for x

$$5^{2-x} = 6^{x+1}.$$

Give first the correct answer; then, round your answer to 4 decimal places.

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6. Find the inverse of the function $f(x) = \sqrt{x+1}$ and determine its domain of definition.

   Sketch the graph of $f(x)$ and $f^{-1}(x)$ in the same coordinate plane.

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7. • Show that the function

$$g(x) = \frac{3^x + 3^{-x}}{2}$$

is an even function (i.e., symmetric with respect to the y-axis).

• Solve the following exponential equation

$$\frac{3^x + 3^{-x}}{2} = 1.$$

8. • Jupiter evolves around the Sun in 12 years. Assuming that Jupiter's orbit is circular, with the Sun at the center, find the radian measure of the angle swept out by a line from the Sun to Jupiter in 5 years. Convert your answer to degrees.

   • Convert $23°42'12''$ to radians.

   Convert 1.2 radians to degrees, minutes, and seconds.

9. Given that $\tan(\theta) = 8/15$ and θ is an acute angle, find the exact values of the remaining 5 trigonometric functions.

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10. From a point 90 ft directly across from a town hall building with a steeple, the angle of elevation to the bottom of the steeple is $30°$. From the same point, the angle of elevation to the top of the steeple is $45°$.

    How high is the steeple?

    What is the vertical distance from the ground to the top of the steeple?

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11. **(EXTRA CREDIT)**

- Use the change base formula to show that

$$(\log_a x)(\log_b y) = (\log_b x)(\log_a y).$$

- Use the previous formula to compute <u>exactly</u>

$$(\log_3 16)(\log_4 9)$$