

## Conceptual Problems

*Please provide a short explanation for your answers in this section.*

1. (3 points) **True/False** The equations  $y = \ln x$  and  $x = e^y$  are equivalent.

2. (3 points) **True/False** For all  $u, v > 0$  the following equation is true:  $\ln(u + v) = \ln u + \ln v$ .

## Computational Problems

3. (4 points) Use polynomial long division to divide  $p(x)$  by  $d(x)$ . Write your answer in the form  $p(x) = d(x)q(x) + r(x)$  where  $q(x)$  is the quotient and  $r(x)$  is the remainder.

$$p(x) = 2x^4 - 3x^2 + x - 1$$

$$d(x) = x^2 - 2x + 1$$

4. (4 points) Use synthetic division to divide the polynomials. Specify the quotient and remainder.

$$(4x^3 + 8x^2 - 9x - 18) \div (x + 2)$$

5. (4 points) Find the vertical asymptotes of  $f(x) = \frac{x-4}{x^2-16}$ , then specify the domain of  $f$ .

6. (4 points) Let  $p(x) = 5x^{138} + 6x^{32} - 5x^4 + 2$ . Find the remainder when  $p(x)$  is divided by  $x - 1$ .

7. (4 points) Let  $f(x) = x^3 - 5x^2 - 2x + 24$ .

a. Use the Rational Roots Theorem (RRT) to find the *possible* roots of  $f(x)$ .

b. Use part (a) to help factor  $f(x)$  into a product of linear polynomials.

8. (4 points) Find the horizontal asymptote of  $G(x) = \frac{5x^8 + 3x^4 + 2x - 1}{7x^8 - 2x + 3}$ .

**9. (4 points)** Suppose Leo places \$20,000 into an account drawing 5% interest, compounded continuously. How long will it take Leo to double his money?

**10. (4 points)**

a. Use properties of logarithms to write  $\ln x + \ln(x + 3)$  as a single logarithm.

b. Solve  $\ln x + \ln(x + 3) = 1$  for  $x$ .