

MPS22 – Precalculus
Exam 2 Review Sheet

Practice Problems:

1. (a) State the domain and range of $y = \ln(x - 6)$.
(b) State the domain, the range, and the equation of the horizontal asymptote of the graph of $y = e^x - 6$
2. Solve for x without using logarithms: $8^{2x-3} = \left(\frac{1}{16}\right)^{x-2}$
3. A man invests \$6,500 in an account that pays 6% interest per year, compounded continuously.
(a) What is the amount after 2 years?
(b) How long will it take for the amount to be \$8,000?
4. A sum of \$1,000 was invested for 4 years, and the interest was compounded semiannually. If this sum amounted to \$1,435.77 in the given time, what was the interest rate?
5. Find the time required for an investment of \$5,000 to grow to \$8,000 at an interest rate of 7.5% per year, compounded quarterly.
6. Write an equation of an exponential function whose graph passes through the points (3, 240) and (7, 15).
7. Express as a single logarithm: $2 \ln x - \frac{1}{2} \ln(x + 5)$
8. Expand: $\ln\left(\frac{4x^2}{y^3\sqrt{z}}\right)$
9. Solve for x to the nearest thousandth:
(a) $6e^{2x} = 72$ (b) $4^{x+3} = 7^x$
10. Solve for x .
(a) $\log_2 x + \log_2 5 = 6$ (b) $3 \ln 2x + 2 = 11$
(c) $2 \ln(2x - 1) - \ln 9 = 0$ (d) $\log_2 x + \log_2(x + 2) = \log_2(x + 6)$
(e) $e^{x \ln 5} = 25$ (f) $15 = \ln 4 - \ln x$

11. A certain type of bacteria increases according to the model $P(t) = 100e^{0.2197t}$, where t represents the time in hours.
- Find the initial number of bacteria.
 - How many bacteria were there after 5 hours?
 - How many bacteria were there after 10 hours?
 - How long will it take for there to be 1,000 bacteria?
12. Q represents the mass (in grams) of a quantity of Carbon-14, whose half-life is 5,730 years. The quantity present after t years is given by $Q = 10(0.5)^{\frac{t}{5730}}$.
- Find the initial quantity.
 - Find the quantity present after 2,000 years.
 - How long will it take for the mass to be 2.5 grams?
13. How much money (to the nearest cent) must be invested at 12% annual interest, compounded monthly, for 40 years to attain a balance of \$500,000?
14. The population P in Montgomery is approximated by $P = 240,360e^{0.012t}$, where t is the number of years since 1990. In what year will the population reach 275,000?
15. Solve:
- $e^x + 2e^{-x} = 3$
 - $(\ln x)^2 - 9(\ln x) = -8$
 - $\sqrt{\ln x} = \ln x^2 + 2\ln \sqrt{x}$
16. If $\log_b x = 60$ and $\log_b y = 20$, what is the value of $\log_y x$?
17. A town's population has been declining exponentially since the local factory closed. Two years after the factory closing, the population was 9,600 people. Six years after the factory closing, the population was 6,144 people. Find an exponential function that models the town's population, and determine how many people were living in the town when the factory closed. (If necessary, round all coefficients to three decimal places.)