

MPS22 – Precalculus
Exam 2 Review Sheet

Practice Problems:

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

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 $\log_y x$?

Use the following formula to answer questions 17 and 18:

$$\text{Newton's Law of Cooling: } T = C + (T_0 - C)e^{-kt}$$

where t = time (in minutes)

T = the temperature of the given object at time t

C = constant temperature of the surrounding medium (the ambient temperature)

T_0 = the initial temperature of the object

k = decay constant

17. Newton's Law of Cooling is used in homicide investigations to determine the time of death. The normal body temperature is 98.6°F. Immediately following death, the body begins to cool. It has been determined experimentally that the constant in Newton's Law of Cooling is approximately $k = 0.1947$, assuming time is measured in hours. Suppose that the temperature of the surroundings is 60°F.
- Find a function $T(t)$ that models the temperature t hours after death.
 - If the temperature of the body is now 72°F, how long ago was the time of death?
18. A roasted turkey is taken from an oven when its temperature has reached 185°F and is placed on a table in a room where the temperature is 75°F.
- If the temperature of the turkey is 150°F after half an hour, what is its temperature after 45 minutes?
 - When will the turkey cool to 100°F?