This collection of problems involves ideas we have studied in chapters 4 and 5 plus section 6.1.
An actual test will have fewer problems and will provide space for work to be shown.

1. [5] The amount (in mg) of a drug in the body decreases exponentially at the rate of 24% per hour; the initial amount was 60 mg. Write a formula for the amount of this drug in the body after t hours.

2. [5] A population is growing at the rate of 1.5% a year. By what percent does it grow in 8 years?

3. [5] Value of some old machinery has decreased exponentially. If the 6–year decrease was 20%, by what percent did it decrease in just one of those years?

4. [12] Let $P(t)$ be the population (millions of people) in a country at time t (years after 1990). Use the following information (data) for both parts of this problem: $P(4) = 2.75$ and $P(12) = 3.19$.
   a) Find a formula for $P(t)$ assuming it is linear. Describe, in words, changes in the country's population given this assumption (linear model).
   b) Find a formula for $P(t)$ assuming it is exponential. Describe, in words, changes in the country's population given this assumption (exponential model).

5. [10] Suppose \$4700 is deposited in an account paying a nominal interest rate of 1.8% per year.
   a) If the interest is compounded semiannually (twice a year), then how much is in the account after 5 years?
   b) If interest is compounded semiannually, then the effective annual rate is ____________ % per year. (Round your numerical answer to 3 decimal places, but show your work below.)

6. [12] In the tables below, assume function f is linear and function g is exponential. Complete each table for $x = 0$ and $x = 4$, then compute $f(7)$ and $g(7)$. If an answer is not an integer, write it as a fraction or as a decimal with 3-decimal place accuracy.

linear

x	$y = f(x)$
0	
2	4
4	
6	16
7	

exponential

x	$y = g(x)$
0	
2	4
4	
6	16
7	

7. [12] A radioactive substance decays at a continuous rate of 16% per year, and 150 mg of the substance is present in the year 2000.
   a) Write a formula for the amount present, A (in mg), t years after 2000.
   b) Estimate when the quantity drops below 10 mg.

8. [16] The amount (mg) of a drug in the body t hours after taking a pill is given by $A(t) = 21\ (0.82^t)$.
   a) What percent of the drug is lost each hour?
   b) What is the half-life of this drug?
   c) Rewrite the equation for this drug as $A(t) = a\,e^{k\,t}$
   d) What is the continuous decay rate per hour of this drug?

9. [14] Solve for t (give *both* exact solution and a three-decimal place approximation).

a) $4 \cdot \ln(t-5) = 6$

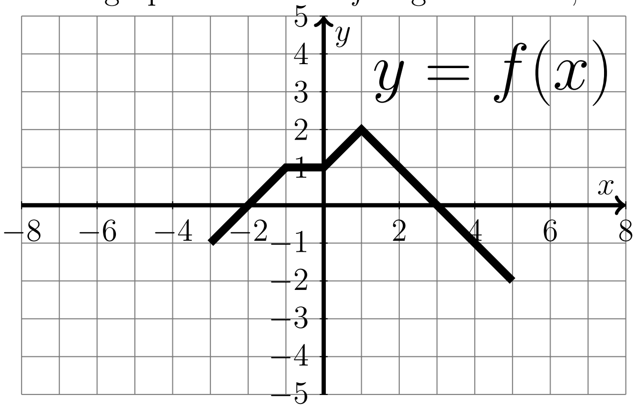
b) $10 \cdot (1.04^t) = 8 \cdot e^{0.05\,t}$

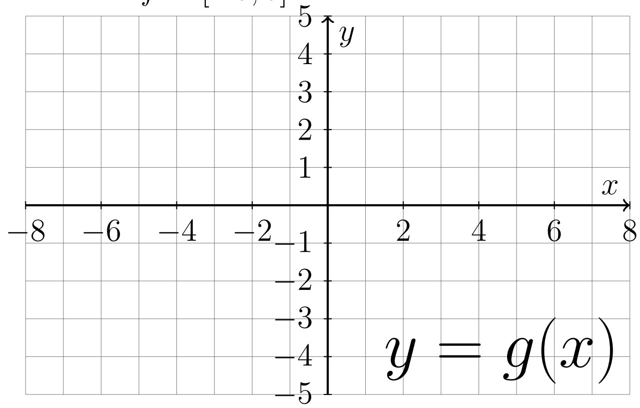
10. [12] Sound in decibels is measured by comparing its intensity [energy per area] I to a benchmark sound intensity I_0 [benchmark is barely audible, its intensity is 10^{-16} watts/cm^2]. Then,

$$\text{Noise level in decibels} = 10 \log\left(\frac{I}{I_0}\right)$$

Suppose sound A measures 30 decibels. Also suppose intensity of sound B is 5 times larger than the intensity of sound A. Show work that finds the decibel rating of sound B [round to nearest integer].

11. [14] The graph of function f is given below; the domain of f is $[-3, 5]$.





a) [3] Use the formula $g(x) = f(-x)$ and the graph of f to compute $g(-1) =$

b) [6] Sketch the graph of $g(x) = f(-x)$ in the righthand grid.

c) [5] Find all x–intercepts for the graph of function $g(x) = f(-x)$.

12. [10] Functions $f(x) = 2^{-x} + 3$ and $g(x) = \ln(x+3)$ are graphed below. Respond to 5 items for each.

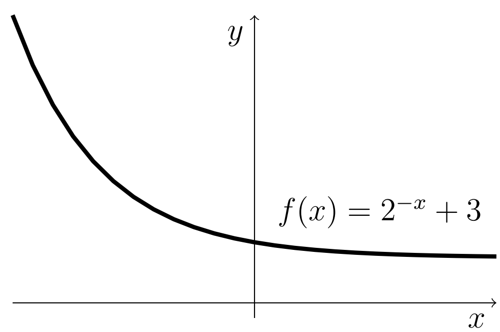
a) • Sketch the asymptote to the graph of $f(x) = 2^{-x} + 3$

• The asymptote to graph of f has equation ____________

• Graph of f has $y-$intercept equal to ____________

• Domain of f is ____________

• Range of f is ____________



b) • Sketch the asymptote to the graph of $g(x) = \ln(x+3)$

• The asymptote to graph of g has equation ____________

• Graph of g has $x-$intercept equal to ______________

• Domain of g is ____________

• Range of g is ____________