1 Week 12 HOGU: 5.5-5.8, Exam 3 Review

Problem 1. Find the domain of each of the following functions. Draw the domain on the number line, then give your answer using interval notation.

(a) $f(x) = \begin{cases} 3x^2 - 4 & \text{if } x < 8 \\ 7 & \text{if } x = 8 \\ \sqrt[4]{x-4} & x > 8 \end{cases}$

(b) $g(x) = \begin{cases} \dfrac{\sqrt[3]{2x-15}}{x} & \text{if } x \leq 1 \\ \dfrac{9}{\sqrt{x-2}} & \text{if } x > 1 \end{cases}$

Problem 2. Your electric bill came in! On your bill you noticed that you were charged \$7 as a base fee, plus \$6 per kilowatt-hour of electricity used up to the first 100 kilowatt-hours. (These numbers were taken from my own electric bill!) After using 100 kilowatt-hours, you notice that the amount you are charged goes up to \$9 per kilowatt-hour. Construct the piecewise function describing the cost $C(x)$, in dollars, that you pay when using x kilowatt-hours of electricity.

Problem 3. State the domain of the following functions:

(a) $f(x) = 4e^{x-1}$

(b) $g(x) = \ln(1 - x)$

(c) $k(x) = \dfrac{\sqrt{x^3 + 8}}{\ln(x)}$

Problem 4. (a) Completely simplify this expression to be in base 6:

$$\frac{36^{x^2}}{6^{-4x}}$$

(b) Fully expand the expression using the properties of logarithms:

$$\ln\left(\sqrt[3]{\frac{x^3}{e^2z^4}}\right).$$

Problem 5. Solve the following equations for x:

(a) $4^{x+1} = 64$

(b) $\ln(x) + \ln(x-2) = \ln(x+10)$

(c) $2 \cdot 3^{-x} = 16$

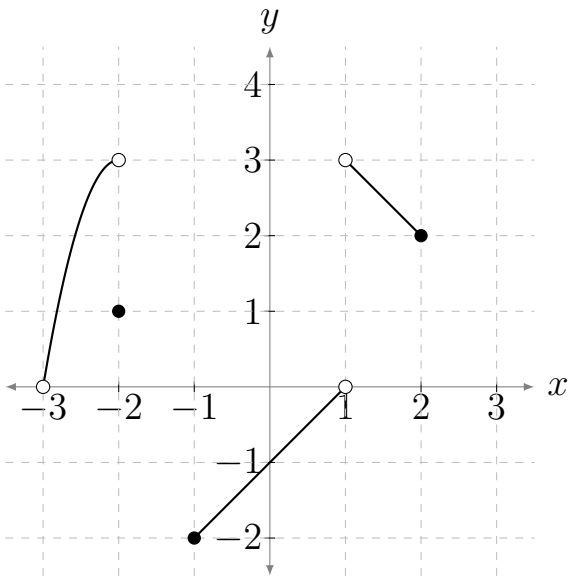
Problem 6. Recall that the accumulated value of an initial deposit, P, for t years, at the interest rate r (expressed as a decimal), is

$$A(t) = P\left(1 + \frac{r}{m}\right)^{mt},$$

where m represents the number of times the interest is compounded in a year.

If you deposit $\$12,000$ in this savings account and the interest rate on the account is 7%, how long would it take the savings account to grow to $\$25,000$? Assume that interest is compounded yearly.

Problem 7. Consider the function $f(x)$ below:



(a) State the domain of $f(x)$. Write your answer in interval notation.

(b) State the range of $f(x)$. Write your answer in interval notation.

Problem 8. Compute and completely simplify the difference quotient for the function $g(x) = -\dfrac{3}{x+1}$.

(a) $g(x+h) =$

(b) $g(x+h) - g(x) =$

(c) $\dfrac{g(x+h) - g(x)}{h} =$

Problem 9. Compute and completely simplify the difference quotient for the function $k(x) = \sqrt{2x-5}$.

(a) $k(x+h) =$

(b) $k(x+h) - k(x) =$

(c) $\dfrac{k(x+h) - k(x)}{h} =$