

2024 Fall Math 140 Week-In-Review

Week 10: Sections 5.5 and 5.6

Some Key Words and Terms: Piecewise Functions, Absolute Value Functions, Domain of a Piecewise Functions, Exponential Expressions, Exponential Functions, Growth vs. Decay, Rewriting Bases.

Piecewise Functions:

Absolute Value Function:

Domain of a Piecewise Function:

Exponential Expressions:

Exponential Functions:

Growth vs. Decay:

Rewriting Bases:

Examples:

1. For the given piecewise functions, determine the given value of the function, if it exists.

$$(a) \ g(x) = \begin{cases} \frac{1}{x+8} & \text{if } x \leq -7 \\ xe^x & \text{if } -7 < x < -1 \\ 3x^2 + 2x - 1 & \text{if } x \geq 1 \end{cases}$$

i. $f(-9) =$

ii. $f(-7) =$

iii. $f(0) =$

$$(b) \ k(x) = \begin{cases} \sqrt{7-4x} & \text{if } x \leq -3 \\ \frac{x(x-1)}{(x-1)(x+1)} & \text{if } -3 < x < 3 \\ 12\left(\frac{1}{2}\right)^x & \text{if } x \geq 3 \end{cases}$$

i. $f(-5) =$

ii. $f(0) =$

iii. $f(3) =$

2. For the given absolute value functions, rewrite them as piecewise functions.

(a) $f(x) = |7 - 3x|$

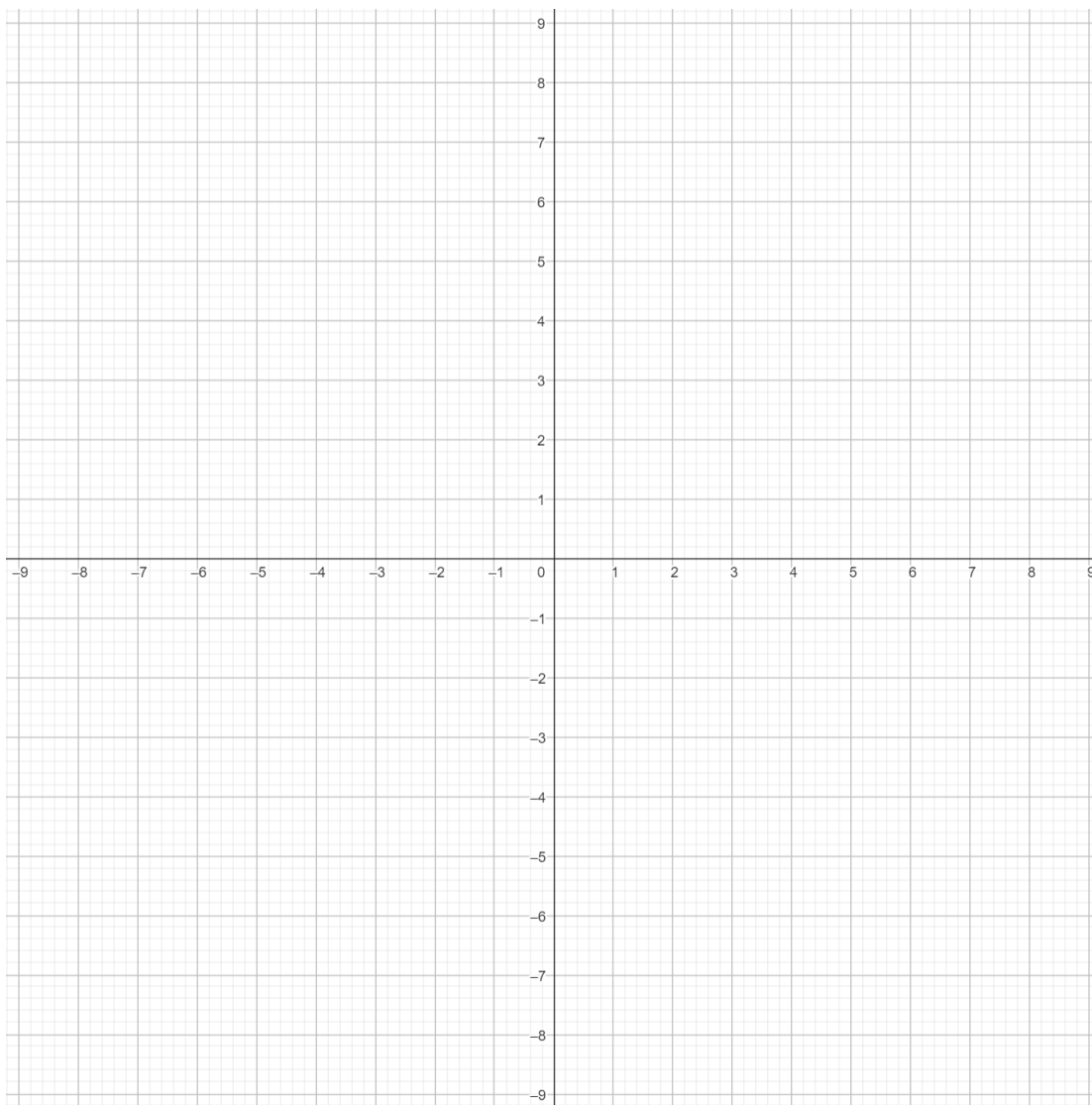
(b) $h(x) = 4|2x + 7| + 5$

3. For the following piecewise function, determine the domain. Give your answer in interval notation.

$$k(x) = \begin{cases} \sqrt{7-4x} & \text{if } x \leq -3 \\ \frac{x(x-1)}{(x-1)(x+1)} & \text{if } -3 < x < 3 \\ 12\left(\frac{1}{2}\right)^x & \text{if } x \geq 3 \end{cases}$$

4. Graph the given piecewise function.

$$k(x) = \begin{cases} -9 - 3x & \text{if } -6 \leq x < -3 \\ -2x^2 + 4x & \text{if } -3 \leq x < 2 \\ -1 & \text{if } 4 < x < 8 \end{cases}$$



5. Simplify the following exponential expressions. Express your answer without denominators.

(a) $\frac{8^{(x+2)}125^x}{5^{(-3x+2)}16^{(2x)}}$

(b) $\left(\frac{9^{4x}25^{-5y}}{5^{(4-y)}27^{2x}}\right)^{-3}$

6. For the following functions, determine the domain and classify them as an exponential function or not. If it is an exponential function, determine if it is exponential growth or exponential decay.

$$(a) f(x) = \frac{x^2(x-1)}{x(x-1)(x+8)}$$

$$(b) g(x) = 3 \cdot (5)^x$$

$$(c) j(x) = \sqrt{19 - 5x}$$

$$(d) g(x) = (-6)^{x+2}$$

$$(e) j(x) = (9)^{-4x}$$

7. Solve the following equations for x . Express your answer in exact form.

(a) $2e^x + 7 = 0$

(b) $\frac{1}{6^{-4x}} = 36^{3x-5}$

(c) $\frac{e^8}{e^{2x}} = \frac{x^{7x}}{e^{-2}}$

8. You decide to change cellphone providers. Your new provider offers unlimited calls and up to (and including) 25 GB of data for \$50 per month. If you use more than 25 GB of data, then you're charged \$1.50 per additional GB after 25 GB up to (and including) 40 GB of data. If you use more than 40 GB of data per month, then you're charged \$1.00 per additional GB after 40 GB. Write a piecewise function, $C(d)$, representing the monthly cost in dollars, C , for using d GB of data.
9. You invest \$7,500 in a savings account that earns 4.3% annual interest compounded continuously. How much money will be in the savings account after 10 years if you make no more deposits? Round your answer to the nearest cent.