

Homework #5 Part A

1. Find the domain and range of the function $h(x) = \ln|x|$, and explain.
2. Find the domain and range of the function $f(x) = e^{x^2}$, and explain.
3. If the domain of $g(x)$ is the set of all positive real numbers (so all $x > 0$), what is the domain of $g(|x|)$? What is the domain of $g(x^2)$? Explain.

In problems 4 through 6, find (and write as simply as possible) the expressions given by the compositions **(a)** $f(g(x))$, **(b)** $g(f(x))$, and **(c)** $f(f(x))$, where the functions $f(x)$ and $g(x)$ are given.

4. $f(x) = \sqrt{x}$, $g(x) = x^2$ (Be careful with $f(g(x))$). Is $\sqrt{x^2} = x$ for all x ?
5. $f(x) = x^2 + x + 1$, $g(x) = 3^x$.
6. $f(x) = e^x$, $g(x) = \sqrt{x}$. Also, if $h(x) = x/2$, explain why $g(f(x)) = f(h(x))$.
7. Find the x and y -intercepts of each of the following functions:
 - (a):** $f(x) = \ln(x^2 - 8x + 13)$
 - (b):** $g(x) = e^{6x} - 3e^{3x} - 10$ (Hint: $e^{6x} = (e^{3x})^2$, so factor this like a quadratic for the x -intercept).
8. For each $f(x)$ given, compute and simplify the expression $\frac{f(x+h) - f(x)}{h}$
 - (a):** $f(x) = x^2 + 5x$
 - (b):** $f(x) = \frac{1}{x}$

November 4, 2015

Due: Monday, November 9, 2015

Homework #5 Part B

1. (a): Sketch a graph of the functions $y = x^2 + 3$, $y = 2^x + 1$, and $y = \ln(x) - 3$, using the graphs of $y = x^2$, $y = 2^x$, and $y = \ln(x)$.

(b): Given a real number c and a function $y = f(x)$, how are the graphs of $y = f(x)$ and $y = f(x) + c$ related?

2. (a): Sketch a graph of the functions $y = (x - 3)^2$, $y = 2^{x-1}$, and $y = \ln(x + 3)$, using the graphs of $y = x^2$, $y = 2^x$, and $y = \ln(x)$.

(b): Given a real number a and a function $y = g(x)$, how are the graphs of $y = g(x)$ and $y = g(x - a)$ related?

3. Find the points of intersection of each of the following pairs of graphs, and sketch the graphs.

(a): $y = x - 3$ and $(x - 3)^2 + (y + 3)^2 = 9$

(b): $y = x^2 + 2$ and $y = 3x + 1$

4. Find the equation of the circle of radius 2 and center $(-3, 1)$, and sketch the graph. Find the equations of two functions $y = f(x)$ and $y = g(x)$ whose graphs together give the graph of this circle.

5. The function $y = f(x)$ is *even* if $f(-x) = f(x)$ for every x and the function $y = g(x)$ is *odd* if $g(-x) = -g(x)$ for every x .

(a): Show that $f(x) = x^4$, $f(x) = |x|$, and $f(x) = 1/x^2$ are each even. Sketch each graph.

(b): Show that $g(x) = x^3$, $g(x) = \sqrt[3]{x}$, and $g(x) = 1/x$ are each odd. Sketch each graph.

(c): What can you say about the graph of an even function and the graph of an odd function?

6. Sketch a graph of each of the following:

(a): $y = |2x + 1|$

(b): $y = |\ln(x)|$

(c): $y = \ln|x|$

(d): $|x| + |y| = 1$