Math 141 Study Guide: Sections 1.1-1.3

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Instructions: Answer all questions. Show all work and justify all your answers in **complete sentences.**

1 Section 1.1

Problem 1) Find the domain of the following functions. Do so **algebraically.**

(a) $f(x) = \dfrac{x-5}{9-\sqrt{x^2-16}}$.

(b) $h(x) = \dfrac{5\sqrt{x^2-x-20}}{4x^2+16x}$.

(c) $g(x) = e^{\sqrt{x-3}}$. Find the **range** for this function as well.

Problem 2) For each of the following functions, **graph** the function, then find the **domain** and **range**. You may use your graphs to justify the range, but clearly explain how the properties of the graph support your conclusion.

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

(b) $f(x) = x^{-2}$

(c) $f(x) = \dfrac{e^x}{x^2-16}$ [**Graph and find the domain only**.]

(d) $f(x) = \dfrac{-x}{x^4-16}$

(e) $f(x) = \dfrac{x^2}{x^2-5x+6}$ [**Graph and find the domain only**.]

(f) $f(t) = \dfrac{-5t}{|t|}$

Problem 3) Using the definitions of even and odd functions, determine whether the following functions are even, odd, both, or neither. Justify your answer.

(a) $f(x) = 5^x$

(b) $f(x) = x^2 + 5$

(c) $f(x) = x^3 - 5$

(d) $f(x) = \sin(x)$

(e) $f(x) = \cos(x)$

(f) $f(x) = \tan(x)$

(g) $f(x) = |5x + 1|$

Problem 4) Suppose that $f(x)$ is a function that is both even and odd. Prove that $f(x) = 0$. [**Hint:** Start by writing out what it means for $f(x)$ to be even; then write out what it means for $f(x)$ to be odd. You should now have a system of equations.]

2 Section 1.2.

Problem 5) Graph the following functions by transforming the parent graph. Rough sketches are fine, though the anchor point should be clearly marked and correct. Make sure there are no glaring errors (e.g., the function is clearly negative at a given point, but you have it above the x-axis).

1. $f(x) = \sqrt{x+7}$
2. $f(x) = 2|x+3| - 1$
3. Suppose our parent graph is $f(x) = x^2$. Shift the graph of $f(x)$ down 3 units, and to the left by 5 units.

3 Section 1.3.

Problem 6) Evaluate the six basic trig functions $(\sin, \cos, \tan, \cot, \csc, \sec)$ along the unit circle.

Problem 7) Evaluate the following. You may freely use any trig identity you wish, but clearly indicate the identity you are using.

(a) $\sin(\pi/8)$

(b) $\cos(\pi/8)$

(c) $\sin(\pi/12)$

(d) $\cos(\pi/12)$

Problem 9) Prove that the following identities hold.

(a) $\cos(2\theta) = 1 - 2\sin^2(\theta)$.

(b) $\sin^2(\theta) = \dfrac{1-\cos(2\theta)}{2}$

(c) $1 - \sec(x)\csc(x)\tan(x) = 1 - \sec^2(x)$.

(d) $\dfrac{\csc(x) - 1}{\cot(x)} = \dfrac{\cot(x)}{\csc(x) + 1}$

(e) $\dfrac{1 - \sin^2(-x)}{1 - \sin(-x)} = 1 - \sin(x)$.

Problem 10) Write $\cos(3x)$ in terms of **only** $\sin(x)$ and $\cos(x)$. [**Note:** There should **not** be any terms of the form $\cos(2x)$ or $\sin(2x)$ in your answer.]