MATH 80: TEST #1

ALEX IOSEVICH

You have sixty minutes to complete the following five problems. Show all your work. No credit will be given for unsupported answers. Please read all of the questions before commencing. The problems are not necessarily listed in the order of difficulty.

Problem #1. *Compute the following limit.*

$$\lim_{x \to 2^-} \frac{x^2 + x + 1}{x^3 \sin(\pi x)}.$$

Problem #2. *A rocket is launched upwards from a 200 foot hill with an initial velocity of 64 feet per second. The height of the rocket is given by the equation*

$$H(t) = 200 + 64t - 16t^2,$$

where t is measured in seconds and H is measured in feet. Compute the average speed of the rocket for $t \in [2, 4]$.

Problem #3. *In Problem #2, compute the instantaneous velocity (speedometer reading) of the rocket after 3 seconds.*

Problem #4. *Let $f(x) = -3x^2 + 18x - 27$. Graph this function and label the y-intercept, the x-intercepts, and all the vertical and horizontal shifts.*

Problem #5. *Let*

$$f(x) = \frac{1}{\sqrt{2 - x} - 2}.$$

Determine the domain and the range of this function.

Problem #6. *(Extra credit) Find the equation of the tangent line to the curve $y = \sin(x)$ at the point $x = \frac{\pi}{4}$. You must derive everything you claim to get credit.*

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