

Name:

Math 115 Practice Exam 1

1) (5 points) Using the definition of the derivative, express the slope of the tangent line to the graph of $f(x) = 6x^3 - 23x^2 + 71x - 8$ at $x = 1$ as a limit BUT DO NOT COMPUTE THE LIMIT.

b) (10 points) Obtain the equation of the tangent line at $x = 1$ to the graph of $f(x) = 6x^3 - 23x^2 + 71x - 8$, using any method at your disposal other than merely your calculator.

2) (15 points) Find all horizontal and vertical asymptotes for the function

$$f(x) = \frac{5x^2 - 7x - 24}{-2x^2 + 15x - 27}.$$

3) (15 points) Find all values of k (if any exist) that make the function

$$f(x) = \begin{cases} -7x + 2kx & x > 3 \\ -\frac{k^2}{3}x + x^2 & x < 3 \\ 2 & x = 3 \end{cases}$$

continuous at $x = 3$.

4) Evaluate the following limits.

a) (5 points) $\lim_{x \rightarrow \pi/3} \cos(x)$

b) (8 points) $\lim_{x \rightarrow 11} \frac{3x - 33}{|x - 11|}$

c) (10 points) $\lim_{x \rightarrow \infty} (\sqrt{9x^2 - x + 1} - 3x)$

d) (10 points) $\lim_{x \rightarrow 1^+} (x - 1) \sin\left(\frac{1}{(x - 1)^2}\right)$

5) (12 points) Show that the function $f(x) = x^8 - 25x^5 - 2x - 19$ has a zero in the interval $[-2, 1]$.