MATH 110–003
Winter 2018
Practice problems 1

Section 1.4: The Tangent Problem

1. Let f be the function defined by $f(x) = 4x^2$. Let x be different from 3. What is the slope m_x of the line through the points $(3, 36)$ and $(x, 4x^2)$? Simplify your answer as much as possible.

2. Let f be the function defined by $f(x) = \frac{2}{3x}$. Let x be different from 0 and 1. What is the slope m_x of the line through the points $(1, \frac{2}{3})$ and $(x, \frac{2}{3x})$? Simplify your answer as much as possible.

3. The point $P(2, -1)$ lies on the curve $y = \frac{1}{1-x}$.

   (a) If Q is the point $(x, \frac{1}{1-x})$, use your calculator to find the slope of the secant line PQ for the following values of x: $1.5, 1.9, 1.99, 1.999, 2.5, 2.1, 2.01, 2.001$.

   (b) Using the results of part (a), guess the value of the slope of the tangent line to the curve at $P(2, -1)$.

   (c) Using the slope from part (b), find an equation of the tangent line to the curve at $P(2, -1)$.

4. Let f be the function defined by $f(x) = -\frac{1}{x^2}$. Let x be different from 0 and 2.

   (a) What is the slope m_x of the line through the points $(2, -\frac{1}{4})$ and $(x, -\frac{1}{x^2})$? Simplify your answer as much as possible.

   (b) Guess the value of $\lim_{x\to 2} m_x$, and determine an equation for the line tangent to the graph of f at $(2, -\frac{1}{4})$.

Section 1.5: The Limit of a Function

1. Use the given graph of f (see Figure 1) to state the value of each quantity, if it exists. If it does not exist, explain why.

   (a) $\lim_{x\to 2^-} f(x)$; (b) $\lim_{x\to 2^+} f(x)$; (c) $\lim_{x\to 2} f(x)$; (d) $f(2)$; (e) $\lim_{x\to 4} f(x)$; (f) $f(4)$.

2. For the function g whose graph is given (see Figure 2), state the value of each quantity, if it exists. If it does not exist, explain why.

   (a) $\lim_{x\to 0^-} g(t)$; (b) $\lim_{x\to 0^+} g(t)$; (c) $\lim_{x\to 0} g(t)$; (d) $\lim_{x\to 2^-} g(t)$; (e) $\lim_{x\to 2^+} g(t)$; (f) $\lim_{x\to 2} g(t)$; (g) $g(2)$; (h) $\lim_{x\to 4} g(t)$.

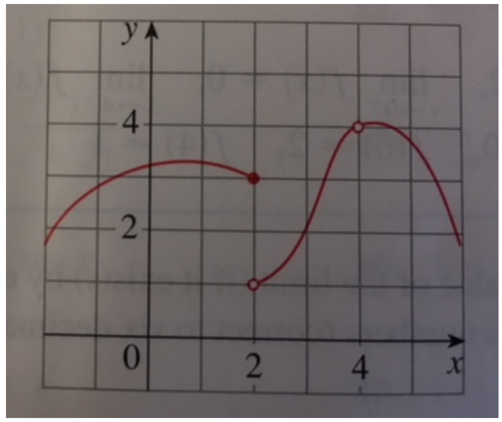

Figure 1

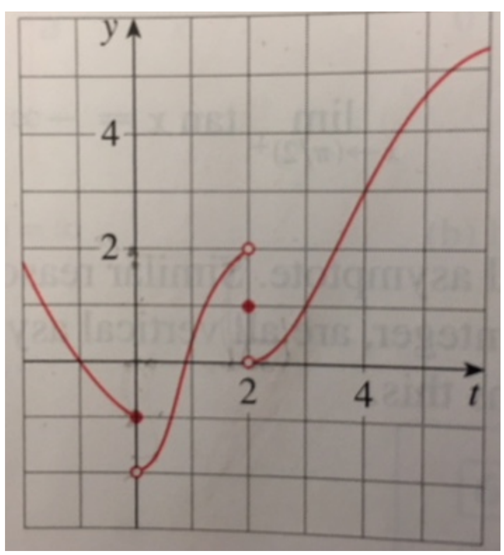

Figure 2