Math 115 - Team Homework Assignment #3, Fall 2015

- **Due Date:** October 8 or 9 (Your instructor will tell you the exact date and time.)
- Note: All problem, section, and page references are to the course textbook, which is the 6th edition of *Calculus: Single Variable* by Hughes-Hallett, Gleason, McCallum, et al.
- Remember to follow the guidelines from the "Doing Team Homework" and "Team HW Tutorial" links in the sidebar of the course website.
- Do not forget to rotate roles and include a reporter's page each week.
- Show ALL your work.

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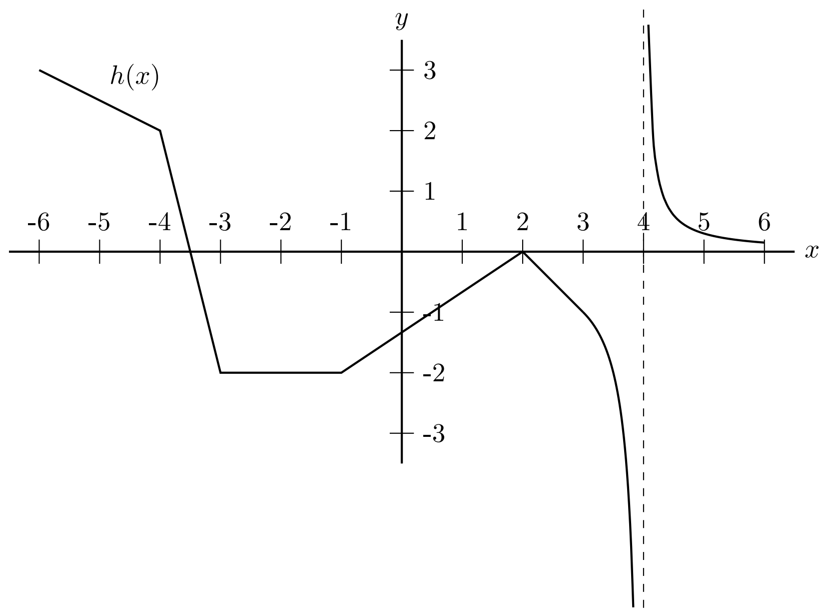
1. Draw a graph of the derivative of the function $h(x)$ shown below. Note that $h(x)$ has a vertical asymptote at $x = 4$.



2. Phillip Asafy is using the math department's 3D printer to make (spherical) globes. Suppose that the time it takes to print a globe is a function of the radius of the globe. Let $T(R)$ be the number of minutes it takes to print a globe of radius R centimeters. Assume that the function T is invertible, and that both T and T^{-1} are differentiable.

   (a) For each of the following three parts, your answers should be in terms of one or more of the functions T, T^{-1}, T', and $(T^{-1})'$.

      i. Write a mathematical equation that expresses the following statement.

         In half an hour, the printer can print a globe of radius 2 feet.

      ii. Write a mathematical equation that supports the following statement.

         Printing a globe of radius 8.2 inches takes approximately
         2 more minutes than printing a globe of radius 7.4 inches.

      iii. Write a mathematical statement that supports the following fact.

         The smaller the radius of the globe, the less time it takes to print.

(b) In the context of this problem, give a practical interpretation of the mathematical statement

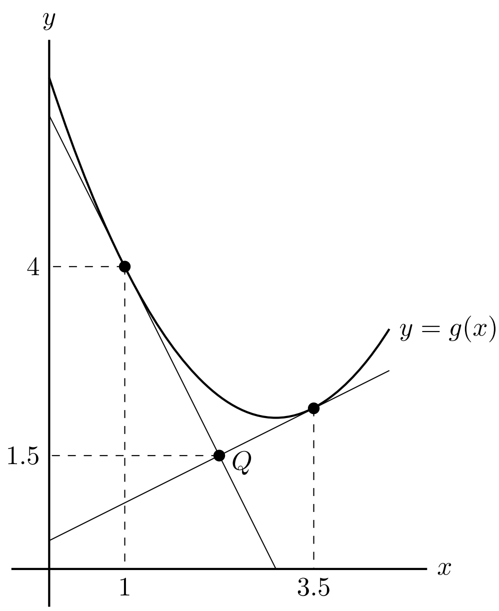
$$(T^{-1})'(18) = 0.4.$$

Remember to use a complete sentence and include units.

(c) Which of the three following possibilities do you think is most likely? You may use your physical intuition, but be sure to explain your reasoning.

$$T'(4) < T'(14) \qquad T'(4) = T'(14) \qquad T'(4) > T'(14)$$

3. A graph of a differentiable function $g(x)$ and its tangent lines at $x = 1$ and $x = 3.5$ is shown below. The two tangent lines are perpendicular. To the right is a table of some values of g.



x	$g(x)$
1.1	3.805
1.01	3.98005
1.001	3.9980005
1.0001	3.999800005

Use this information to estimate each of the following:

(a) $g'(1)$

(b) The coordinates of the point Q

(c) $g'(3.5)$

(d) $g(3.5)$