1. (30 pts) The following three problems are not related.

   (a) Find the derivative of $y = \cos(x \sin x)$. Leave your answer unsimplified.

   (b) Find an equation for the line tangent to $y = \left(x^2+1\right)\left(2x^3+3\right)$ at $x = 1$. Express your answer in point-slope form.

   (c) Find dy/dx given
   $$\frac{y}{y^3+5} = 2x^{3/2} - 3$$
   by applying the quotient rule to the left side of the equation. Express your answer in terms of x and y.

2. (18 pts)

   (a) State the limit definition of the derivative for a function $f(x)$.

   (b) Let $f(x) = 3x^2 + 7$.

      i. Use the limit definition to find $f'(x)$.

      ii. For the given $f(x)$, find all values of c that satisfy the conclusion of the Mean Value Theorem on the interval $[-1, 2]$. You may assume that $f(x)$ satisfies the hypotheses of the theorem.

3. (14 pts) Let $g(x) = 2 + \sqrt[3]{x}$.

   (a) Find the linearization of $g(x)$ at $x = 1$.

   (b) Use the linearization to approximate the value of $g(0.7)$.

   (c) Is the approximation an underestimate or overestimate? Be sure to justify your answer.

4. (12 pts) Timmy leaves home at 8 a.m. and walks west toward school at $\frac{3}{2}$ m/sec. At the same time, his dog, Lassie, heads south to visit the dog park, trotting at 2 m/sec. After 8 seconds, how fast is the distance between them changing?

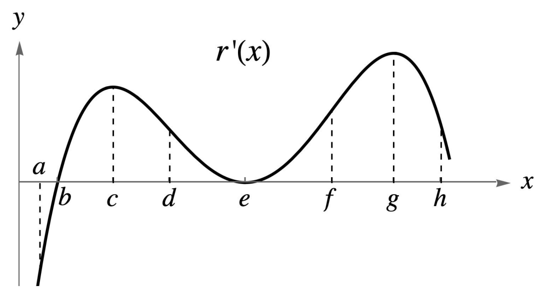
5. (26 pts) Problems 5a and 5b are not related.

   (a) Let $h(x) = \left(x^2 - 4\right)^3$.

      i. Find the critical numbers of h.

      ii. Use the First Derivative Test to classify each critical number as a local minimum, local maximum, or neither.

(b) The graph of derivative $r'(x)$ is shown below.



i. Among the x-coordinates a, b, c, d, e, f, g, and h, enter the coordinate(s) that correspond to each of the following quantities.

ii. At what value(s) of x does the function $r(x)$ have horizontal tangents?

iii. On what interval(s) is the function $r(x)$ concave up or down? Use the given coordinates as endpoints of the intervals.

No justification is necessary for problem 5b.