Worksheet 2

ALL work must be shown for solutions of problems submitted for group classwork.

PART I - Sections 2.6, 2.7, 2.8

Section 2.6

Problem 1. Sketch the graph of an example of a function f that satisfies all of the given conditions:

$$\lim_{x \to 0} f(x) = \infty, \quad \lim_{x \to 3^-} f(x) = -\infty, \quad \lim_{x \to 3^+} f(x) = \infty, \quad \lim_{x \to -\infty} f(x) = 1, \quad \lim_{x \to \infty} f(x) = -1.$$

Problem 2. Find the limit or show that it does not exist.

$(a) \quad \lim_{u \to -\infty} \frac{(u^2 + 1)(2u^2 - 1)}{(u^2 + 2)^2}, \qquad (b) \lim_{x \to -\infty} \frac{\sqrt{1 + 4x^6}}{2 - x^3}, \qquad (c) \lim_{x \to \infty} \sqrt{x^2 + 2x} - \sqrt{x^2 + x}.$

Section 2.7

Problem 3. Find an equation of the tangent line to the curve at the given point.

$$y = \sqrt{1 - 3x}, \qquad (-1, 2).$$

Problem 4. A cliff diver plunges from a height of 100 feet above the water surface. The distance the diver falls in t seconds is given by the function $d(t) = 16t^2$ feet.
(a) After how many seconds will the diver hit the water?
(b) With what velocity does the diver hit the water?

Section 2.8

Problem 5. A rechargeable battery is plugged into a charger. The graph below shows $C(t)$, the percentage of full capacity that the battery reaches as a function of time t elapsed (in hours).
(a) What is the meaning of the derivative $C'(t)$?
(b) Use the graph of $C(t)$ below to sketch the graph of $C'(t)$. What does the graph tell you?
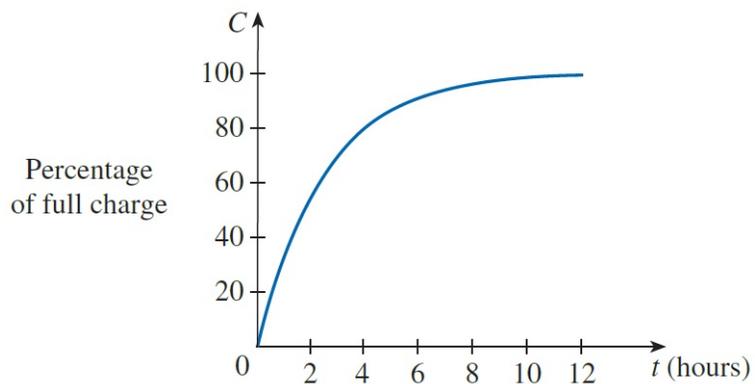
Problem 6. Find the derivative of each of the functions using the limit definition of the derivative. State the domain of the function and the domain of the derivative.

$$(a)\ f(x) = x^4, \qquad (b)\ g(x) = \frac{1}{\sqrt{1+x}}.$$

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