Problem Set 3-7

Quick Review

Q1. Write one condition for f to be continuous at $x = c$.

Q2. Write another condition for f to be continuous at $x = c$.

Q3. Write the third condition for f to be continuous at $x = c$.

Q4. Is the signum function, $f(x) = \operatorname{sgn} x$, continuous at $x = 0$?

Q5. Find dy/dx if $y = 20x^{4/5}$.

Q6. Find $f(x)$ if $f'(x) = 30x^{-4}$.

Q7. Function f in Problem Q6 is called a(n) —?—.

Q8. Sketch the graph of $y = \sin x$.

Q9. Sketch the graph of $y = \cos x$.

Q10. The first positive value of x for which $\sin x = \dfrac{\sqrt{3}}{2}$ is

A. π B. $\dfrac{\pi}{2}$ C. $\dfrac{\pi}{3}$

D. $\dfrac{\pi}{4}$ E. $\dfrac{\pi}{6}$

1. State the chain rule in each form.
   a. Using dy/dx terminology
   b. Using $f'(x)$ terminology
   c. Verbally, using the words *inside function* and *outside function*
2. Given $f(x) = (x^2 - 1)^3$:
   a. Differentiate using the chain rule.
   b. Expand the power, then differentiate term by term.
   c. Show that the answers to parts a and b are equivalent.

For Problems 3–22, find an equation for the derivative function. You may check your answer by comparing its graph with the numerical derivative graph.

3. $f(x) = \cos 3x$
4. $f(x) = \sin 5x$
5. $g(x) = \cos(x^3)$
6. $h(x) = \sin(x^5)$
7. $y = (\cos x)^3$
8. $f(x) = (\sin x)^5$
9. $y = \sin^6 x$
10. $f(x) = \cos^7 x$