The Chain Rule P-Set

Find the derivative of each.

1. $f(x) = (x+3)^4$
2. $f(x) = (5-x)^3$
3. $g(x) = (2x+4)^3$
4. $y = (10-5x)^4$
5. $f(x) = (8x^2 - 2x + 5)^{94}$
6. $f(x) = \sqrt{3x+6}$
7. $y = \sqrt[3]{4x-3}$
8. $g(x) = \frac{2}{(x-7)^6}$
9. An actuary has determined that for a certain demographic group the number of people surviving over the duration of a century can be modeled by

   $$f(x) = 400\sqrt{100-x} \quad 0 \le x \le 100$$

   where x represents the age of the person in years in the group and $f(x)$ represents the number of people surviving. Evaluate and interpret $f'(70)$.

An anti-theft device company determines the cost to produce car antitheft devices is modeled by

$$C(x) = (3x+6)^{1.5} + 30 \quad [0, 50]$$

where x represents the number of antitheft devices produced in hundreds and $C(x)$ represents the production costs in thousands of dollars.

10. Determine the marginal cost function, $C'(x)$.
11. Evaluate and interpret $C'(5)$.

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Key

1. $4(x+3)^3$
2. $-3(5-x)^2$
3. $6(2x+4)^2$
4. $-20(10-5x)^3$
5. $94(8x^2 - 2x + 5)^{93}(16x - 2)$
6. $\frac{3}{2}(3x+6)^{-1/2}$
7. $\frac{4}{3}(4x-3)^{-2/3}$
8. $-12(x-7)^{-7}$
9. $f'(70) \approx -36.5$; the number of people expected to live to 70 years old is decreasing by about 36.5 people/(years of age)
10. $C'(x) = 4.5(3x+6)^{0.5}$
11. $C'(5) \approx 20.6$; when 500 devices are produced, the costs of producing the next 100 is about \$20.6 thousand.