2.1 Chain Rule: Quiz B

Name: _____ Time: 25 minutes No calculator 40 points

To the extent possible under law, the author(s) have waived all copyright and related or neighboring rights to this practice quiz. CC0 1.0 Universal: https://creativecommons.org/publicdomain/zero/1.0/. Prepared with assistance from Claude, an AI model made by Anthropic. **Provided AS IS, without warranty of any kind; use at your own risk.** Not every item has been vetted; problems, answers, and keys may contain errors.

Answer exactly the question asked. Show work on every question. Angles are in radians. Answers need not be simplified.

1. Find each derivative. **(2 each, 12 pts)**

   (a) $f(x) = (2x^3 - x + 5)^3$. Find $f'(x)$.

   (b) $y = \sin(5x - x^3)$. Find $\dfrac{dy}{dx}$.

   (c) $y = \sec(x^4)$. Find y'.

   (d) Find $\dfrac{d}{dx}\left[\sqrt[3]{x^2 + 5x}\right]$.

   (e) $V(t) = t^2(3t + 1)^4$. Find $\dfrac{dV}{dt}$.

   (f) $q(x) = \dfrac{4}{(1 - 3x)^3}$. Find $q'(x)$.

2. Find each derivative. **(2 each, 6 pts)**

   (a) $y = \left[\sec^2(3x) - \tan^2(3x) + 2\right]^4$. Find $\dfrac{dy}{dx}$.

   (b) $m(t) = \sqrt[3]{(t - 2)(t + 2) - t^2 + 12}$. Find $m'(t)$.

   (c) Find $\dfrac{d}{d\left(\tan(2x) + x^6 - 3\sqrt[3]{x}\right)}\left[\left(\tan(2x) + x^6 - 3\sqrt[3]{x}\right)^4\right]$.

3. Let $f(x) = (x - 2)^5 + 1$ and $g(x) = \sqrt[5]{x - 1} + 2$. **(2 each, 4 pts)**

   (a) Let $h(x) = f(g(x))$. Find $h'(2)$.

   (b) Let $k(x) = g(f(x))$. Find $k'(x)$.

4. In this question, y is the independent variable. The letter x stands for a function of y that is not constant, and $\dfrac{dx}{dy}$ stands for its derivative. Answers may contain x, y, and $\dfrac{dx}{dy}$. **(2 each, 4 pts)**

   (a) $f = 2x^4 + y^3$. Find $\dfrac{df}{dy}$.

   (b) $f = \tan(x^3)$. Find $\dfrac{df}{dy}$.

5. Figure B5 shows the graphs of f (solid) and g (dashed). Each graph is made of straight line segments that meet at grid points. **(3 each, 6 pts)**

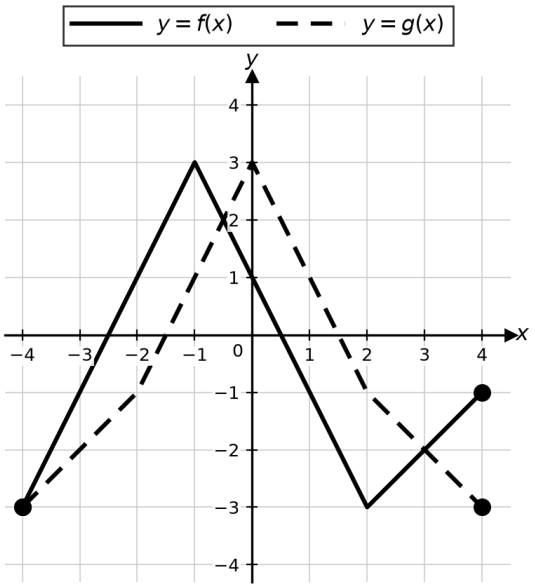


Figure B5

   (a) Let $h(x) = f(g(x))$. Find $h'(3)$.

   (b) Let $k(x) = g(f(x))$. Find $k'(-3)$.

6. The table gives selected values of f, g, and their derivatives. **(3 + 3 + 2, 8 pts)**

x	$f(x)$	$g'(x)$	$f'(x)$	$g(x)$
0	4	3	-1	2
2	0	-2	3	4
4	2	1	5	-3

   (a) Let $h(x) = g(f(x))$. Find $h'(2)$.

   (b) Let $k(t) = f(t^2)$. Find $k'(2)$.

   (c) Let $h(x) = g(f(x))$. Find $h(2)$.