2.3-2.5 Derivative Rules: Form B Assessment

Name: _____ Time: 60 minutes No calculator 100 points

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

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

   (a) $y = (x^3 + 2)\cot(x)$. Find y'.

   (b) $y = \dfrac{3 - x}{x^2 + 1}$. Find $\dfrac{dy}{dx}$.

   (c) $y = \dfrac{\sec\left(\dfrac{\pi}{3}\right)}{\csc\left(\dfrac{\pi}{6}\right)}$. Find y'.

   (d) $y = \dfrac{8}{\sqrt{x}} - 2x^3$. Find y''.

2. (a) Find $\dfrac{d^{42}}{dx^{42}}[\sin(x)]$. **(10 pts)**

   (b) A particle moves along a line with position $s(t) = t^3 - 6t^2 + 9t + 1$. Find the velocity at the time when the acceleration is 0.

3. The table gives values of f, g and their derivatives. **(10 pts)**

x	$f'(x)$	$g(x)$	$f''(x)$	$g'(x)$	$f(x)$
2	2	5	4	-1	-3
4	-2	-2	3	6	1

   (a) Let $q(x) = \dfrac{f(x)}{g(x)}$. Find $q'(2)$.

   (b) Let $r(x) = (f(x))^2$. Find $r''(2)$.

4. Find each derivative. **(12 pts)**

(a) $y = \csc(\sqrt{x})$. Find $\dfrac{dy}{dx}$.

(b) $f(x) = \dfrac{4}{\sqrt{2x^2+1}}$. Find $f'(x)$.

(c) $s = \sin^4(t^2)$. Find $\dfrac{ds}{dt}$.

(d) $y = \cos(x)(1-3x)^4$. Find y'.

5. Figure B5 shows f (solid) and g (dashed), made of segments joined at grid points. **(8 pts)**

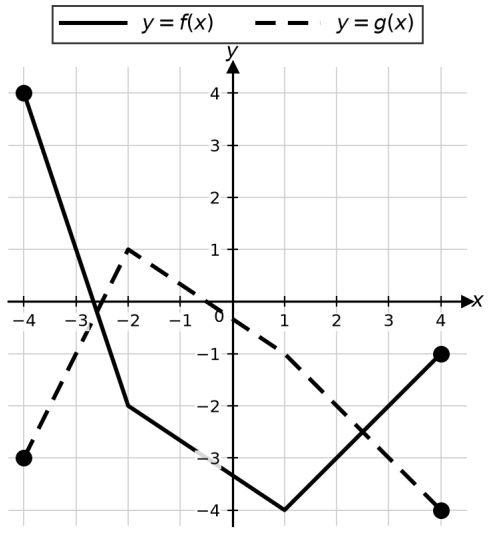


Figure B5

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

(b) Let $m(x) = g(f(x))$. Find $m'(2)$.

6. Let $f(x) = (5-x^2)^3 - 1$. Find an equation of the line tangent to the graph of f at $x = 2$. **(6 pts)**

7. (a) Let $f(x) = (x-1)^3 + 2$, $g(x) = \sqrt[3]{x-2} + 1$, and $h(x) = f(g(x))$. Find $h'(10)$. **(6 pts)**

(b) Find $\dfrac{d}{dt}\left[(\sin(4t) + \cos(4t))^2 - 2\sin(4t)\cos(4t)\right]$.

8. Find $\dfrac{dy}{dx}$. **(8 pts)**

(a) $y^2 - x\cos(y) = 2x$

(b) $(2x+y)^2 - (2x-y)^2 = 4x + 8$

9. Figure B9 shows the graph of g. The curve $y + g(xy) = 1$ passes through $(2, -1)$. **(9 pts)**

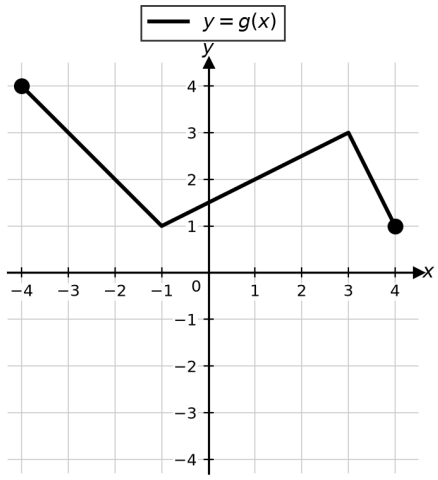


Figure B9

(a) Find $\dfrac{dy}{dx}$ at $(2, -1)$.

(b) Find an equation of the line tangent to the curve at $(2, -1)$.

10. Find the tangent lines to $x^2 - xy + y^2 + 2x = 8$ where the curve crosses the x-axis. **(7 pts)**

11. In this question only, y is the independent variable and x is a function of y. **(4 pts)**

    For $x^2y + \tan(x) = y^3$, find $\dfrac{dx}{dy}$.

12. The curve $2x^2 - y^2 = 7$ passes through $(2, 1)$. Find $\dfrac{d^2y}{dx^2}$ at $(2, 1)$. **(8 pts)**