Calculus: Derivatives practice

Name _____ Block _____

Show all work. Simplify as far as you can. Mark your final answer. **2 points** are for notation, neatness, organization, and clarity. No trig. No calculator needed.

1. A function g is differentiable. [4 points]

a. In a sentence or two, say what the number g'(4) is, and what the function g'(t) is.

b. Sketch a curve with the tangent line at $t = 4$. Label the point of tangency, and label the slope as g'(4). Do not sketch the graph of g'.

2. Find the derivative of $p(x) = 3x^2 - 5x + 1$ in two ways. [6 points]

a. Use the limit definition.

b. Use derivative rules. The two answers should match.

3. Find each derivative. Any method from class is fine. Simplify.

a. $W(s) = 2s^4 - 3/s^2 + 5s$

[3 points]

b. $y = (x^4 - 3\sqrt{x} + 6) / x$

[4 points]

c. Use the product rule on $f(x) = (x^2 - 4x)(3x + 1)$. Do not expand first. Then simplify.

[4 points]

d. Use the quotient rule on $q(x) = (2x^2 + 5) / (x - 3)$. Simplify the numerator.

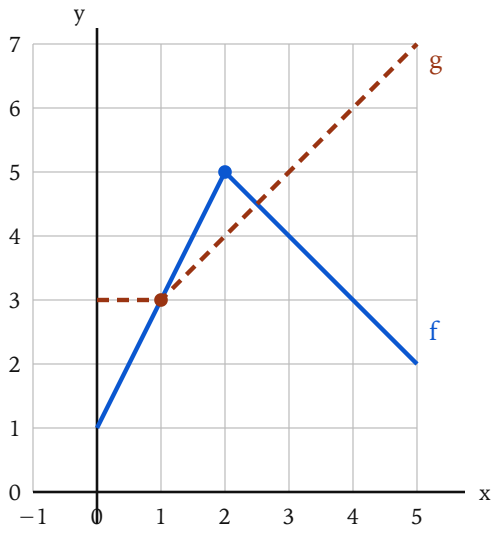
[4 points]

4. Using only the limit definition, find the derivative of $f(x) = x^3$. Show the algebra that cancels h. Do not quote the power rule as the reason. [4 points]

5. f is the solid graph. g is the dashed graph. Let $h(x) = f(x) \cdot g(x)$. Find each value. If the derivative is not defined, say so. [3 points]

a. $h'(0)$ b. $h'(2)$ c. $h'(4)$

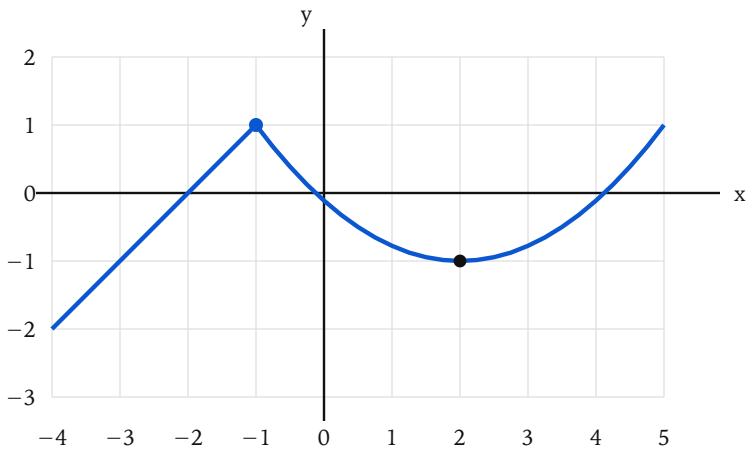
A corner means the derivative of that function is not defined there. Read the slope of each piece. Do not invent a single formula for the whole graph.



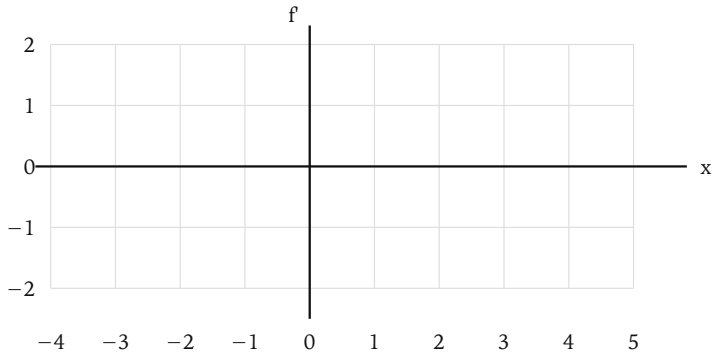
6. Let $m(x) = (x^2 - 5)(2x + 4)$. Find the equation of the line tangent to m at $x = 1$. Give the line in slope-intercept form, $y = mx + b$. [6 points]

7. The graph of f is below. On the blank grid, sketch f′. Shape matters more than exact heights. Mark a few slopes on the original graph so the thinking is visible. Leave a hole where the derivative is not defined. [3 points]

f. The left piece is straight. It meets a parabola at a corner. The parabola bottoms out at $(2, -1)$.



Sketch f′ on this grid. Same x-scale.



8. Suppose $f(x) = ax^2 + bx + 2$, with $f'(1) = 8$ and $f'(-2) = -4$. Find a and b. [1 point]