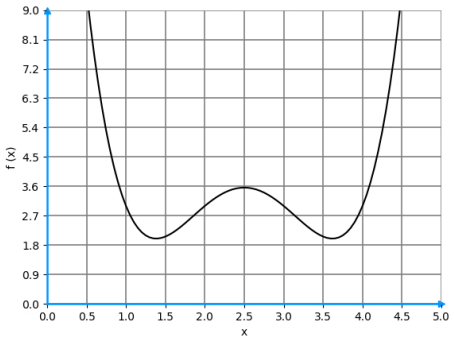
1. Which of the following represents the derivative of a function $f(x)$ (check all that apply)? 1 point

- [ ] $F(x)$
- [x] $f'(x)$
- [ ] $f'(x^2)$
- [x] $\frac{df(x)}{dx}$
- [ ] $\frac{f(x)}{df(x)}$

2. Consider the graph of the following function $f(x)$. 1 point



Regarding **its derivative**, $f'(x)$, where $x \in [0, 5]$: (check all that apply)

- [ ] $f'(x)$ is always positive.
- [x] $f'(x)$ has three zeros, i.e., $f'(x) = 0$ three times.
- [ ] $f'(x)$ has two zeros, i.e., $f'(x) = 0$ twice.
- [x] $f'(1) < 0$.
- [x] $f'(4) > 0$.

3. What is the derivative of $3x^3 - 2x + 1$? 1 point

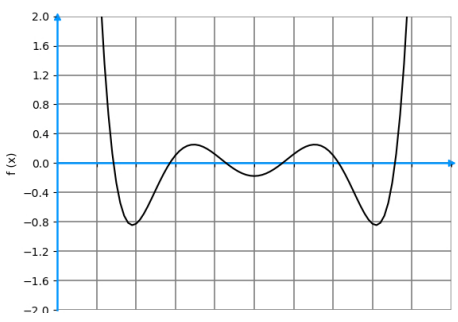
- ( ) $3x^2 - 2$
- ( ) $9x^2 - 2 + 1$
- (•) $9x^2 - 2$
- ( ) $9x^3 - 1$

4. Suppose you have a game where you toss a coin 20 times and win if you get, in this exact order, 16 heads and 4 tails. However, in this game, you can choose any coin and toss it 20 times. 1 point

Which of the following functions you need to maximize in order to find the best coin for this game? Consider p being the probability of a given coin being heads.

- ( ) $16\log(p) + 4\log(p)$
- (•) $16\log(p) + 4\log(1 - p)$
- ( ) $4\log(p) + 16\log(1 - p)$
- ( ) $4\log(1-p) + 16\log(1-p)$

5. Let $f(x)$ be a real valued function. How many zeros has its derivative $f'(x)$ in the domain plotted in the graph below? 1 point



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6. If $f(x)$ and $g(x)$ are differentiable functions, then the derivative of $f(x)g(x)$ is given by: 1 point

- (•) $f'(x) \cdot g(x) + g'(x) \cdot f(x)$
- ( ) $f'(x) \cdot g'(x) + f(x) \cdot g(x)$
- ( ) $f'(x) \cdot g(x) - f(x) \cdot g'(x)$
- ( ) $f'(x) \cdot g'(x)$

7. The **rate of change** of $f(x) = x^2 + 3$ at $x = 6$ is: 1 point

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8. Let $f(x)$ be a **positive** real function and $g(x) = \log f(x)$. 1 point

Check all that apply.

- [ ] $\frac{df(x)}{dx} = \frac{dg(x)}{dx}$
- [x] If x_{max} is a point where $f(x_{max})$ is a local maximum, then $g(x_{max})$ is also a local **maximum**.
- [ ] If x_{max} is a point where $f(x_{max})$ is a local maximum, then $g(x_{max})$ is also a local **minimum**.
- [x] If $f(x)$ is differentiable, then so is $g(x)$.

9. Using the **chain rule,** the derivative of e^{-x} is: 1 point

- ( ) e^{-x}
- ( ) $-e^{x}$
- (•) $-e^{-x}$
- ( ) e^{x}