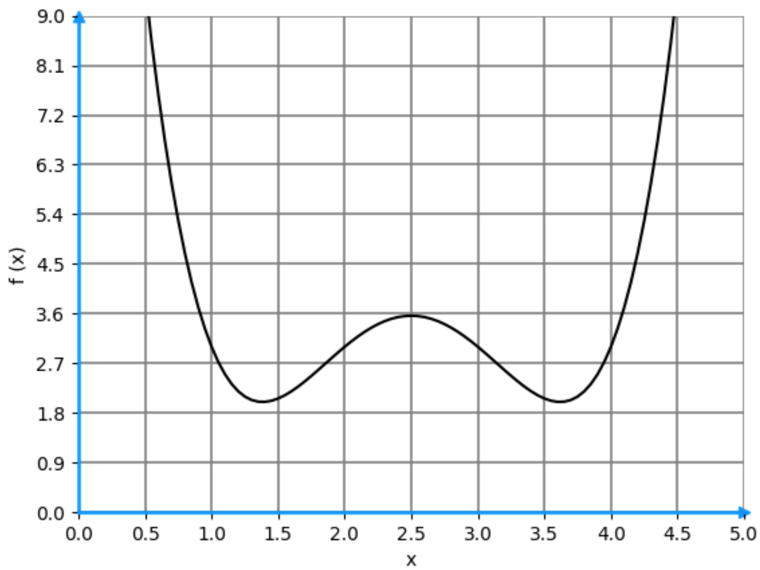
1. Which of the following represents the derivative of a function $f(x)$ (check all that apply)? 1 point

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

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.
- ☐ $f'(x)$ has three zeros, i.e., $f'(x) = 0$ three times.
- ☐ $f'(x)$ has two zeros, i.e., $f'(x) = 0$ twice.
- ☐ $f'(1) < 0$.
- ☐ $f'(4) > 0$.

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

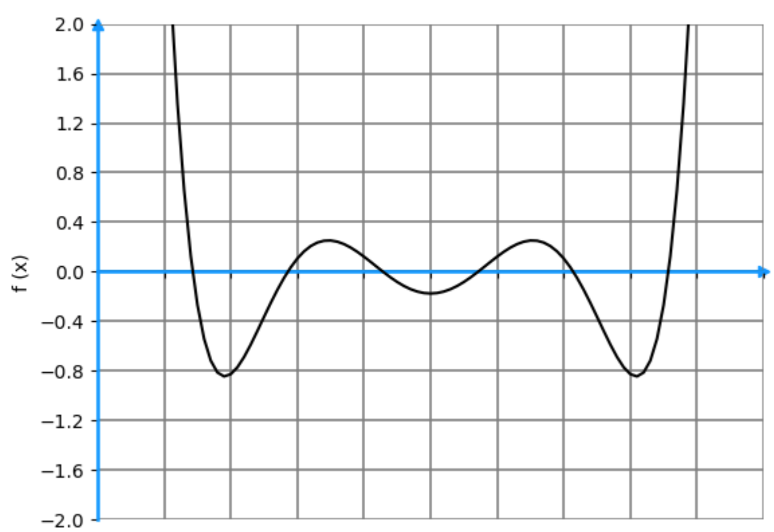
- $3x^2 – 2$
- $9x^2 – 2 + 1$
- $9x^2 – 2$
- $9x^3 – 1$

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



No answer

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**

No answer

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

Check all that apply.

- ☐ $\frac{df(x)}{dx} = \frac{dg(x)}{dx}$
- ☐ 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**.
- ☐ 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}
- ○ $-e^{x}$
- ○ $-e^{-x}$