3. [7 points] The function g defined by $g(x) = \ln(x^2 + 1)$ is differentiable for all x in $(-\infty, \infty)$. For all $x > 0$, the function $B(x) = \dfrac{1}{x}\displaystyle\int_0^x \ln(t^2 + 1)\, dt$ gives the average value of $g(x)$ over the interval $[0, x]$.
Note: Your answers may require one or more integral signs. However, neither the letter g nor the letter B should appear in your answers.

a. [4 points] Calculate $B'(x)$.

Answer: $B'(x) =$ _____

b. [3 points] Write a formula for the average value of g' over the interval $[0, x]$.

Answer: Average value of g' over $[0, x]$ equals _____

4. [5 points] Determine whether the integral $\displaystyle\int_0^3 \frac{1}{x^{\pi/4}}\, dx$ converges or diverges.

- If the integral converges, circle "Converges", find its exact value, and write the exact value on the answer blank provided.
- If the integral diverges, circle "Diverges" and carefully justify your answer.

In either case, you must show all your work and use proper notation. Evaluation of integrals must be done **without using a calculator**.
Note that $\dfrac{1}{x^{\pi/4}} = x^{-\pi/4}$.

Circle one:

$\displaystyle\int_0^3 \frac{1}{x^{\pi/4}}\, dx$ **converges to** _____ or $\displaystyle\int_0^3 \frac{1}{x^{\pi/4}}\, dx$ **diverges**