

Name:

It consists of 2 questions. Please show all your work to get full credit
1 (5 pts) Find the **second** derivative of the function.

(a) $f(x) = e^{-4x} + 2e^{3x}$

(b) $f(x) = \ln x^2$

Sol

(a) $f'(x) = -4e^{-4x} + 6e^{3x}$

$f''(x) = 16e^{-4x} + 18e^{3x}$

(b) $f(x) = 2 \ln x$

$f'(x) = \frac{2}{x}$

$f''(x) = -\frac{2}{x^2}$

2 (5 pts) The radioactive element polonium decays according to the law

$$Q(t) = Q_0 \cdot 2^{-(t/140)}$$

where Q_0 is the initial amount and the time t is measured in days. If the amount of polonium left after 280 days is 20 mg, what was the initial amount present?

Sol

$$20 = Q_0 \cdot 2^{-\left(\frac{280}{140}\right)}$$

$$20 = Q_0 \cdot 2^{-2} = \frac{Q_0}{4}$$

$$\Rightarrow Q_0 = 80 \text{ mg}$$