What is the quadratic approximation of $f(x) = e^{x+x^2}$ near $x = 0$?

31/7/25

$f(x) = e^{x+x^2}$

$f'(x) = e^{x+x^2} \cdot (2x+1)$

$f'(0) = 1(0+1)$

$= 1$

$f''(x) = e^{x+x^2}(2x+1)(2x+1) + e^{x+x^2}(2)$

$= e^{x+x^2}((2x+1)^2+2)$

$f''(0) = 1(1+2)$

$= 3$

$f(x) \approx f(0) + f'(0)x + \frac{f''(0)}{2}x^2$

$= 1 + 1(x) + \frac{3}{2}x^2$

$= \frac{3}{2}x^2 + x + 1$