Day 3 Practice Problem Solutions

① a) $e^{3x} = 9$

$\ln(e^{3x}) = \ln(9)$

$3x = \ln(9)$

$\boxed{x = \frac{\ln(9)}{3}}$

b) $2\ln(x+4) = 6$

$\ln(x+4) = 3$

$e^{\ln(x+4)} = e^3$

$x + 4 = e^3$

$\boxed{x = e^3 - 4}$

② $N(t) = 2e^{0.4t}$

a) 0.4 1/days

b) # people

c) $N(10) = 2e^{0.4(10)} \approx \boxed{110 \text{ people}}$

d) $\frac{dN}{dt} = 2e^{0.4t}(0.4) = 0.8e^{0.4t}$

@ $t = 20$, $\frac{dN}{dt} = 0.8e^{0.4(20)} = \boxed{2385 \frac{\text{infections}}{\text{day}}}$

③ a) $f(x) = 2x^2 + 4e^{x-6}$

$\boxed{\frac{df}{dx} = 4x + 4e^{x-6}}$

b) $f(x) = x^3(4e^{5x} - x)^7$

$\boxed{\frac{df}{dx} = x^3(7(4e^{5x} - x)^6(20e^{5x} - 1)) + (4e^{5x} - x)^7(x^3)}$

c) $f(x) = -5\ln(3x+1)$

$\frac{df}{dx} = -5\left(\frac{1}{3x+1}\right)(3)$

$\boxed{\frac{df}{dx} = \frac{-15}{3x+1}}$

(4) a) $\frac{df}{dx} = 2x+1$

$f(x) = \int 2x+1 \, dx$

$\boxed{f(x) = x^2 + x + C}$

b) $\frac{df}{dx} = 4x^2 - 2x$

$f(x) = \int 4x^2 - 2x \, dx$

$\boxed{f(x) = 4\frac{x^3}{3} - x^2 + C}$

c) $\frac{df}{dx} = -6x + 10x^4$

$f(x) = \int -6x + 10x^4 \, dx$

$f(x) = -6\frac{x^2}{2} + 10\frac{x^5}{5} + C$

$\boxed{f(x) = -3x^2 + 2x^5 + C}$