Improper Integrals – Evaluate the following definite integrals, or prove that they diverge

1. $\int_0^\infty e^{-3x}\,dx$

2. $\int_1^\infty 1 + x^{-1}\,dx$

Hint: This integral is a standard form – check your textbook for a formula!

3. $\int_1^\infty \frac{1}{x^4}\,dx$

4. $\int_0^3 \frac{2}{\sqrt{9-x^2}}\,dx$

Differential Equations – Find a function, *f*, that satisfies each set of conditions

$f'(x) = 10e^{-\frac{x}{2}}, \qquad f(0) = 4$

$\frac{df}{dx} = f^2 e^{-x}, \qquad f(0) = \frac{1}{2}$