Identifying and classifying equilibria

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have in \([-4\pi, 4\pi]\)? Mark them as stable or unstable.
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A. 5 critical points, 2 stable.
B. 8 critical points, 3 stable.
C. 8 critical points, 4 stable.
D. 9 critical points, 4 stable.
E. 9 critical points, 5 stable.
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How would you classify the equilibrium solution of the equation

\[ y' = (1 - y)^2 \]?
Solving a first-order ODE

The equation $y' - 1 = xy^2 + x + y^2$

A. is linear.

B. is autonomous.

C. is separable.

D. does not have a unique solution for a given initial condition.
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B. is autonomous.
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Find the general solution of this equation.
Chemical reactions

A second order chemical reaction involves the interaction (collision) of one molecule of a substance $P$ with one molecule of a substance $Q$ to produce one molecule of a new substance $X$. Let $p$ and $q$ denote the initial concentrations of $P$ and $Q$ respectively, and let $x(t)$ denote the concentration of $X$ at time $t$. The rate at which $X$ is produced is proportional to the product of amount of $P$ and $Q$ remaining in the system. Write down the differential equation governing the system.
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If $x(0) = 0$, find the limiting value of $x(t)$ as $t \to \infty$ without solving the differential equation.
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If \( x(0) = 0 \), find the limiting value of \( x(t) \) as \( t \to \infty \) without solving the differential equation.

(a) \( p \)
(b) \( q \)
(c) \( \max(p, q) \)
(d) \( \min(p, q) \)
(e) \( \frac{p + q}{2} \)