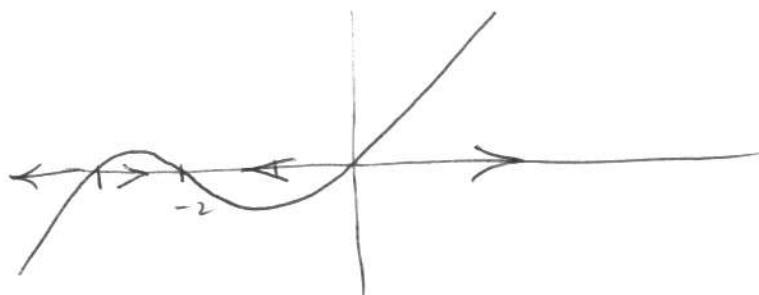


1. A variable $N(t)$, taking values $-\infty < N < \infty$, satisfies $dN/dt = N(N+2)(N+3)$.
 (a) Find the equilibrium (critical) values of N and classify each as stable or unstable.



$N = 0$ unstable
 $N = -2$ stable
 $N = -3$ unstable

- (b) Find $\lim_{t \rightarrow \infty} N(t)$ for each initial condition below.

(i) $N(0) = -3$: -3

(ii) $N(0) = -1$: -2

(iii) $N(0) = 1$: ∞

2. Let $\phi(t)$ be a solution of the problem $y' = t^2 + y$, $y(2) = 3$. Use one step of Euler's method with $h = 0.2$ to find an approximate value of $\phi(2.2)$.

$$\begin{aligned} y_1 &= y_0 + f(t_0, y_0)h \\ &= y_0 + (t_0^2 + y_0)h \\ &= 3 + (2^2 + 3)(0.2) \\ &= 3 + 7(0.2) \\ &= 4.4 \end{aligned}$$

$$\begin{aligned} t_0 &= 2 \\ y_0 &= 3 \\ h &= 0.2 \end{aligned}$$