Cal II (S) (Maths 201–NYB)

Answers

1. The limits:

   (a) $3/2$ (b) -2 (c) $\mathrm{e}^{-4/3}$

2. The improper integrals:

   (a) diverges (b) $\frac{1}{2}$ (*i.e.* converges)

3. (a) $\displaystyle\int_0^{\pi/4} (\cos x - \sin x)\,dx = \sqrt{2} - 1$

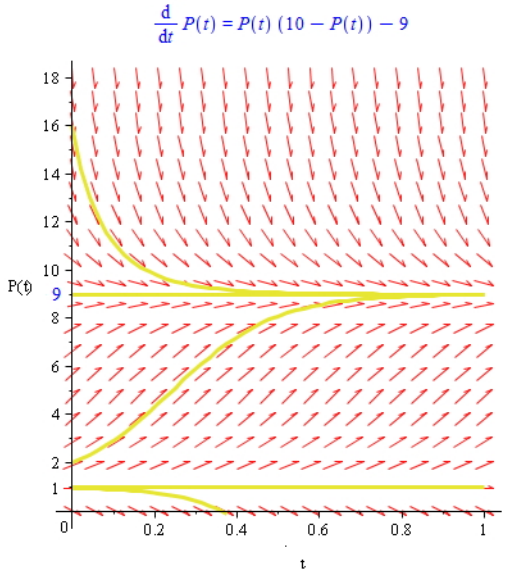
   (b) $\displaystyle 2\pi \int_0^{\pi/4} (x+1)(\cos x - \sin x)\,dx = 2\pi(\sqrt{2}\pi/4 + \sqrt{2} - 2)$

   (c) $\displaystyle \pi \int_0^{\pi/4} (\cos^2 x - \sin^2 x)\,dx = \pi/2$

4. $\frac{3}{8} + \ln 2$

5. $x = c\sqrt{\left|\frac{y-1}{y+1}\right|}$ or $y = \frac{1+cx^2}{1-cx^2}$

6. $P' = 0$ if $P(10-P) - 9 = 0$, *i.e.*
   $P^2 - 10P + 9 = (P-1)(P-9) = 0$, so
   the equilibrium values are at $P_\infty = 1, 9$.
   P increases for $1 < P_0 < 9$,
   and decreases otherwise,
   except for the constant solutions
   $P = 1$ and $P = 9$.
   Sample graphs shown.



7. $25/\mathrm{e}$