Cal II (S) (Maths 201–NYB)

Answers

1. The integrals:

   (a) $\frac{1}{2}\ln 2 - \frac{1}{4}$ (b) $\frac{1}{3}(x^2-9)^{3/2} + 9\sqrt{x^2-9} + C$

   (c) $\frac{\pi}{4} - \frac{1}{2}\ln 2$ (d) $-\frac{1}{2}x^3\cos 2x + \frac{3}{4}x^2\sin 2x + \frac{3}{4}x\cos 2x - \frac{3}{8}\sin 2x + C$

   (e) $x^2 + 4x + \frac{1}{4}\ln|x| - \frac{1}{2x} + \frac{31}{4}\ln|x-2| + C$

   (f) $\arcsin((x-1)/2) + C$

2. The limits:

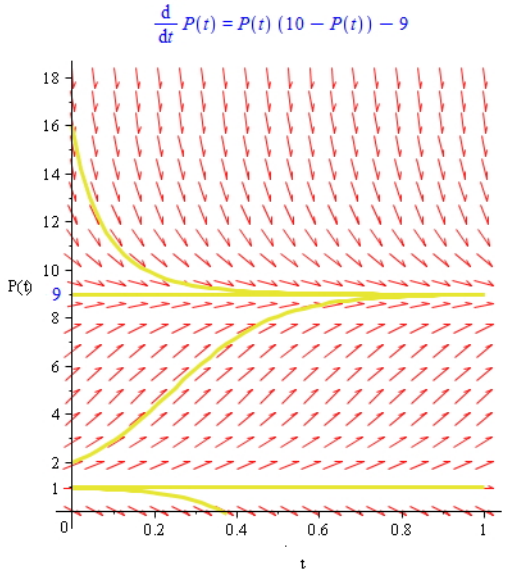
   (a) $3/2$ (b) -2 (c) $\mathrm{e}^{-4/3}$

3. The improper integrals:

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

4. $x = c\sqrt{\frac{y-1}{y+1}}$ or $y = \frac{1+cx^2}{1-cx^2}$

5. $P' = 0$ if $P(10-P) - 9 = 0$, so the equilibrium values are at $P = 1, 9$.
   P increases for $1 < P < 9$,
   and decreases otherwise.
   Sample graphs shown.



6. (a) $\int_0^{\pi/4} (\cos x - \sin x)\,dx$ (b) $2\pi\int_0^{\pi/4} (x+1)(\cos x - \sin x)\,dx$

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

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