1. **Compute the following**

(a) $\displaystyle\int_0^1 e^{\sqrt{x}} x^{-1/2}\, dx$

(b) $\displaystyle\int_0^2 \frac{dx}{(x-1)^2}$

(c) $\displaystyle\int_0^\infty e^{-st}\sin(at)\, dt$

(d) $\displaystyle\int_0^\infty e^{-st} t\, dt$

(e) $\displaystyle\int_1^3 \frac{dx}{\sqrt{(x-1)(3-x)}}$

2. Find the limit of the following sequences or determine that the sequence diverges.

(a) $\left\{\dfrac{(n+1)!}{n!}\right\}$

(b) $\left\{\dfrac{(2n)!n^2}{(2n+2)!}\right\}$

(c) $\left\{\dfrac{\sin n}{2^n}\right\}$

(d) $\left\{\left(\dfrac{1}{n}\right)^{1/\ln n}\right\}$

(e) $a_n = 1 + \dfrac{1}{a_{n-1}}$ with $a_1 = 1$