HW3 - Some Solutions

1.

$$\begin{aligned}\vec{r}(t) &= < t^2 - 2\ln t, 4t, t^2 + 2\ln t > \\ \vec{r}(t) &= < a\cos bt, a\sin bt >\end{aligned}$$

(i).

$$\begin{aligned}\vec{r}(t) &= < t^2 - 2\ln t, 4t, t^2 + 2\ln t > \\ \overrightarrow{v} &= \left\langle 2t - \frac{2}{t}, 4, 2t + \frac{2}{t} \right\rangle \\ \overrightarrow{a} &= \left\langle 2 + \frac{2}{t^2}, 0, 2 - \frac{2}{t^2} \right\rangle \\ \overrightarrow{T} &= = \left\langle \frac{t^2-1}{\sqrt{2}(t^2+1)}, \frac{2t}{\sqrt{2}(t^2+1)}, \frac{1}{\sqrt{2}} \right\rangle \\ \overrightarrow{N} &= = \left\langle \frac{2t}{t^2+1}, -\frac{t^2-1}{t^2+1}, 0 \right\rangle\end{aligned}$$

(ii).

$$\begin{aligned}\vec{r}(t) &= \langle a\cos bt, a\sin bt \rangle \\ \overrightarrow{v} &= \langle -ab\sin bt, ab\cos bt \rangle \\ \overrightarrow{a} &= \left\langle -ab^2\cos bt, -ab^2\sin bt \right\rangle \\ \overrightarrow{T} &= = \langle -\sin bt, \cos bt \rangle \\ \overrightarrow{N} &= = \langle -\cos bt, -\sin bt \rangle\end{aligned}$$

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$$\begin{aligned}&11. \quad f(x,y) = 2xy - 3x + 4, \quad R = \text{for all } z, \\ &13. \quad f(x,y) = \sqrt{25 - x^2 - y^2}, \quad R = \left\{ z \middle| \, 0 \le z \le 5 \right\}, \\ &15. \quad f(x,y) = \sin\left(\frac{x}{y}\right), \quad R = \left\{ z \middle| -1 \le z \le 1 \right\}, \\ &17. \quad f(x,y) = \ln\left(x^2 - y\right), \quad R = \text{for all } z.\end{aligned}$$