1. Compute E, F, and G for the sphere of radius a paramtrized by

$$\sigma(u, v) = a(\cos u \cos v, \cos u \sin v, \sin u)$$

2. Let f be the map $f : S_1 \to S_2$ between the uv-pane, $S_1 : z = 0$, and the cylinder, $S_2 : x^2 + y^2 = 1$, given by

$$f(u, v) = (\cos u, \sin u, v).$$

   Compute $Df_p(w)$ when $p = (\frac{\pi}{4}, -2)$ and $w = -\vec{i} + 3\vec{j}$.

3. Let $\sigma(u, v)$ be a patch of the surface S with first fundamental form

$$E = 1 + 4u^2, F = -4uv, G = 1 + 4v^2,$$

   and let $\gamma(t) = \sigma(u(t), v(t))$ with $u(t) = t, v(t) = t$, and $-1 \leq t \leq 1$. Find the length of γ.

4. Assume that $\sigma(u, v) = (u, v, u^2 + v^3)$ is a patch of a surface S.
   (a) Is there a point on S at which the tangent plane to S is perpendicular to $(-1, 1, 0)$? Explain.
   (b) Show that $p = (2, -1, 3) \in S$.
   (c) Using p in part (b) show that $w = (1, -1, 1)$ is in T_pS.
   (d) Using the above p and w find a vector v in T_pS that is perpendicular to w.

5. (Kiselev): $178, 179, 180, 197, 200, 201$.

6. (Pressley): $6.1.1, 6.1.2, 6.1.3, 6.2.1, 6.2.2$.