SDS 383D The Multivariate Normal Distribution

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D: Affine Transformation of Independent Normals

$$x = Lz + \mu; \qquad z \sim \mathrm{N}(0, 1) \tag{1}$$

$$\mathrm{E}[x] = \mathrm{E}[Lz] + \mathrm{E}[\mu] = L\mathrm{E}[z] + \mu = \mu \tag{2}$$

$$\mathrm{cov}(x) = \mathrm{cov}(Lz, Lz) + \mathrm{cov}(Lz, \mu) + \mathrm{cov}(\mu, Lz) + \mathrm{cov}(\mu, \mu) \tag{3}$$
$$= L\mathrm{cov}(z, z)L^T = LL^T \tag{4}$$