All references to the Earth assume the line element on a sphere:

$$ds^2 = r^2 \left(d\theta^2 + \sin^2\theta \, d\phi^2 \right)$$

with a radius r of approximately 4000 miles.

1. **DISTANCE**

    Corvallis is located at approximately (44.6°N,123.3°W), that is, 44.6° north of the equator (latitude), and 123.3° west of the prime meridian (longitude). Tangent is located at approximately (44.6°N,123.1°W), and Eugene, is at approximately (44.1°N, 123.1°W).

(a) Find the approximate distance between Corvallis and Tangent.

(b) Find the approximate distance between Tangent and Eugene.

(c) Find the approximate distance between Corvallis and Eugene.

(d) How good are your approximations?

2. **EARTH DISTANCE**

    Portland is located at approximately (45.5°N,122.5°W), that is, 45.5° north of the equator (latitude), and 122.5° west of the prime meridian (longitude). San Francisco is located at approximately (37.5°N,122.5°W), and Richmond, VA, is at approximately (37.5°N, 77.5°W).

(a) Find the approximate distance between Portland and San Francisco.

(b) Find the approximate distance between San Francisco and Richmond.

(c) Find the approximate distance between Portland and Richmond.

(d) How good are your approximations?

    You should avoid doing messy computations! If you really feel one is necessary, it is sufficient to describe the computation without completing it.