

## 0.1 Covariant and contravariant bases

In element form we write a vector as:

$$v = e_i v^i$$

The indices are raised and lowered to reflect whether the value is covariant or contravariant.

$v^i$  is contravariant. If the basis moves one way, it moves the other.

$e_i$  is covariant. If the basis moves, it moves with it.