

Index

A

- Abelian groups *p.24*
- Adjoint operators *pp.43 – 44, 87, 103*
- Affine spaces *p.93*
- Autonomous systems *p.7*

B

- Bifurcation *pp.11 – 12, 63 – 64*
- Body velocity *p.38*

C

- Centroid of area *pp.4 – 6*
- Connection vector field *pp.118 – 119*
- Conservative vector fields *pp.145 – 146*
- Constraint, holonomic *pp.76 – 77*
- Constraint, nonholonomic *pp.110 – 117, 135 – 136*
- Cotangent bundle *p.126*
- Cotangent space *p.126*
- Cotangent vector *pp.127 – 130*
- Cross product *pp.1 – 2*
- Curl (vector) *p.145*
- Curvature (constraint) *pp.144 – 145*

D

- Degrees of freedom *p.17*
- Diffeomorphic *p.20*
- Direct product of two sets *p.20*
- Direct sum *p.20*
- Direct sum of two sets *p.125*
- Directional linearity *p.106*
- Distribution (allowable velocities) *pp.112, 148 – 150*

E

- Embedding *p.96*
- Equivalent vectors w.r.t. functions *pp.100 – 101*
- Euler-lagrange equation *p.136*
- Existence and uniqueness theorem *pp.11, 13*
- Exponential map *pp.48 – 51, 103 – 104*
- External forces *p.1*

F

- Force couple *p.2*
- Force couple system *p.3*
- Forward kinematics *pp.78, 83 – 84*
- Fundamental vector field (infinitesimal generators) *pp.99 – 100*

G

- Gait generation *p.124*
- Generalized coordinates *p.78*
- Geodesics *pp.44 – 46, 51, 96 – 99*
- Gradient vector field *pp.129 – 130*

| | |
|----------------------------------|--|
| Group | <i>pp.</i> 21, 94 – 95 |
| Group invariant vectors | <i>p.</i> 100 |
| Group, left/right action | <i>pp.</i> 24 – 29, 33, 80, 96, 137 |
| Group, symmetry | <i>pp.</i> 108 – 109, 137 |
| <i>H</i> | |
| Holonomic constraint | <i>pp.</i> 76 – 77 |
| Homeomorphic | <i>p.</i> 19 |
| Hysteresis | <i>pp.</i> 66, 70 – 71 |
| <i>I</i> | |
| Image (algebra) | <i>p.</i> 124 |
| Internal forces | <i>p.</i> 1 |
| Invariance | <i>p.</i> 139 |
| Isomorphic | <i>p.</i> 22 |
| <i>J</i> | |
| Jacobian | <i>pp.</i> 84 – 86 |
| <i>K</i> | |
| Kernel | <i>pp.</i> 124 – 125 |
| Kinematic locomotion | <i>pp.</i> 105 – 107 |
| <i>L</i> | |
| Lie algebra | <i>pp.</i> 41, 98 – 100, 103, 151 – 152 |
| Lie bracket | <i>pp.</i> 148 – 150 |
| Lie groups | <i>pp.</i> 21, 96 – 99 |
| Lifted actions | <i>pp.</i> 31 – 42, 52 – 54, 85, 137 – 138 |
| Linearity (mapping) | <i>pp.</i> 106 – 107 |
| Linearization at a fixed point | <i>pp.</i> 10 – 11 |
| Local connection | <i>pp.</i> 114 – 117, 120, 122 – 123, 130, 142 |
| Locomotion | <i>p.</i> 104 |
| <i>M</i> | |
| Manifolds | <i>pp.</i> 17 – 19, 93 |
| Manifolds, accessible | <i>pp.</i> 76 – 78 |
| Manifolds, c^k -differentiable | <i>p.</i> 20 |
| Manifolds, curvature | <i>p.</i> 93 |
| Manifolds, topology | <i>p.</i> 93 |
| Modular addition | <i>p.</i> 21 |
| Momentum | <i>pp.</i> 138 – 140 |
| Monotonic function | <i>p.</i> 13 |
| Multiplicative calculus | <i>pp.</i> 34 – 38, 46 – 47 |
| <i>N</i> | |
| Noether's theorem | <i>pp.</i> 131 – 134 |
| Noncommutativity | <i>p.</i> 147 |
| Nonconservativity | <i>pp.</i> 145 – 147 |
| Nonholonomic constraint | <i>pp.</i> 110 – 117, 135 – 136 |
| <i>O</i> | |
| One-form | <i>pp.</i> 125, 127 – 129 |
| Optimal frame | <i>p.</i> 83 |
| <i>P</i> | |
| Pfaffian constraint | <i>pp.</i> 111 – 117 |

| | |
|-----------------------------------|---------------------------|
| Phase portrait | <i>pp.</i> 7 – 9 |
| Position trajectory | <i>p.</i> 105 |
| Potentials | <i>p.</i> 17 |
| Preimage (algebra) | <i>p.</i> 124 |
| Principally kinematic system | <i>p.</i> 139 |
| Principle of least action | <i>pp.</i> 131 – 133 |
| <i>R</i> | |
| Reaction force | <i>p.</i> 4 |
| Reconstruction equation | <i>pp.</i> 114 – 123, 138 |
| Rigid body | <i>p.</i> 23 |
| Rigid body, left lifted action | <i>pp.</i> 38 – 41 |
| Rigid body, right lifted action | <i>pp.</i> 41 – 43 |
| <i>S</i> | |
| Semidirect product of two sets | <i>p.</i> 24 |
| Shape trajectory | <i>p.</i> 105 |
| Spatial velocity | <i>pp.</i> 43, 85 |
| Special euclidean group | <i>p.</i> 23 |
| Special orthogonal group, $so(n)$ | <i>p.</i> 22 |
| Symmetry | <i>pp.</i> 108 – 109, 131 |
| <i>T</i> | |
| Tangent spaces | <i>pp.</i> 29 – 30 |
| Tensor product | <i>p.</i> 20 |
| <i>U</i> | |
| Underactuated system | <i>p.</i> 104 |
| <i>V</i> | |
| Varignon's theorem | <i>p.</i> 1 |
| Vector field | <i>pp.</i> 30 – 31 |
| Vertical space | <i>p.</i> 125 |
| <i>W</i> | |
| Work (mechanical) | <i>p.</i> 145 |
| <i>Z</i> | |
| Zero set | <i>pp.</i> 76, 110 – 111 |