

# Linear Algebra (Math 220)

## Assignments

Spring Semester, 2003

Assignments are listed by the **date due**.

PDF and DVI (requires  $TeX^1$  software) versions of this page are available for printing.

Most of these assignments are simply exercises designed to prepare you for the quizzes and the written assignments. Those which are to be submitted as written assignments are so labeled. While you may find it helpful to discuss the exercises with others, no collaboration is permitted on the written assignments.

**Wed., May. 14:**

**Final Examination, 3:30 – 5:30**

**Tue., May. 13:**

Office Hours : 2:30 – 3:30

**Mon., May. 12:**

Office Hours: 12:30 – 1:30

**Fri., May. 9:**

Office Hours: 3:00 – 4:00

**Mon., May. 5:**

**Review Session:** bring questions

**Fri., May. 2:**

**Review Session:** bring questions

**Wed., Apr. 30:**

*Affine Maps*

**Definition.** If  $V$  is a vector space, a translation  $t : V \rightarrow V$  is a map that is given by  $t(x) = x + a$  for some  $a$  in  $V$  and all  $x$  in  $V$ .

**Definition.** If  $V$  is a vector space, an affine map  $f : V \rightarrow V$  is a map that may be written as the composition  $t \circ l$  where  $l : V \rightarrow V$  is a linear map and  $t : V \rightarrow V$  is a translation.

Note that saying  $f = l \circ t$  i.e.,  $f(x) = l(x + a)$  for some  $a$  in  $V$ , rather than  $f = t \circ l$ , i.e.,  $f(x) = l(x) + a$  for some  $a$  in  $V$ , would change the definition of affine map.

**Exercises:**

1. Find an affine map  $f$  of  $\mathbf{R}^2$  for which  $f(0, 0) = (1, -1)$ ,  $f(1, 0) = (4, -1)$ , and  $f(0, 1) = (4, 3)$ .
2. When  $f$  is an affine map, let  $\lambda(f)$  denote its linear component. Show that  $\lambda(g \circ h) = \lambda(g) \circ \lambda(h)$ .
3. Show that an affine map  $f$  is invertible if and only if its linear component  $\lambda(f)$  is invertible.
4. (**Corrected**) Show that if  $f$  is an invertible affine map of  $V$  and  $t$  a translation of  $V$ , then  $f \circ t \circ f^{-1}$  is a translation.

**Mon., Apr. 28:**

**Read:** § 6.5

**Exercises:**

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<sup>1</sup>URI: <http://www.tug.org/>

**430:** 18  
**437:** 24, 26, 29  
**284:** 26, 28  
**368:** 16, 20  
**385:** 1, 5

**Fri., Apr. 25:**

**Exercises:**

**430:** 11  
**437:** 18  
**284:** 15 – 18, 22  
**368:** 6, 7, 10, 13, 14

**Wed., Apr. 23:**

**Read:** § 6.4

**Exercises:**

**417:** 16 – 18  
**430:** 10(f, h, j), 12  
**437:** 11, 17  
**284:** 10 – 12  
**368:** 2 – 5

**Mon., Apr. 21:**

**Read:** § 4.4

**Exercises:**

**417:** 12, 15  
**429:** 7, 9, 10(a, c, e)  
**437:** 3, 4, 7  
**283:** 1 – 3, 5, 7

**Wed., Apr 16 - Fri., Apr 18:**

University Recess: **No class.**

**Mon., Apr. 14:**

**Read:** § 8.3

**Exercises:**

**359:** 40  
**406:** 20, 21, 23  
**417:** 11, 13, 14  
**429:** 5, 6  
**437:** 1

**Fri., Apr. 11:**

**Read:** § 8.2

**Exercises:**

**359:** 38, 39  
**406:** 11, 12, 18, 19  
**417:** 4, 6, 7, 9, 10  
**429:** 3

**Wed., Apr. 9:**

**Read:** § 8.1

**Exercises:**

**359:** 29, 30 – 35  
**395:** 16, 18, 19, 20  
**406:** 6 – 8, 14, 15  
**417:** 1, 3

**Mon., Apr. 7:**

**Exercises:**

**349:** 33, 34  
**359:** 23, 24, 26, 28  
**395:** 15, 21, 23  
**406:** 3, 5

**Fri., Apr. 4:**

**Read:** § 7.2

**Exercises:**

**348:** 26, 28, 29  
**358:** 16, 17, 19, 20, 22  
**395:** 10, 11, 14  
**406:** 2

**Wed., Apr. 2:**

**Read:** § 7.1

**Exercises:**

**336:** 30, 32, 34  
**348:** 20, 21, 23 – 25  
**358:** 7, 12, 15  
**394:** 3, 6, 8, 9

**Mon., Mar. 31:**

**Read:** § 6.3

**Exercises:**

**315:** 19, 21, 22, 25, 26  
**336:** 26 – 29  
**348:** 8, 9, 11, 12, 18, 19  
**358:** 1 – 5, 9, 11

**Fri., Mar. 28:**

**Read:** § 6.2

**Exercises:**

**301:** 38 – 41  
**315:** 16 – 18  
**336:** 11, 12, 16, 17, 23, 25  
**347:** 2, 3, 5, 7

**Wed., Mar. 26:**

**Read:** § 6.1

**Exercises:**

**301:** 25, 35  
**315:** 8, 11, 15  
**336:** 2 – 4, 7 – 9, 15

**Mon., Mar. 24:**

**Read:** § 5.3

**Exercises:**

**271:** 30, 31, 35  
**300:** 14 – 16, 30, 31  
**315:** 3, 5, 9, 13  
**325:** 6

**Fri., Mar. 21:**

**Read:** § 5.2

**Exercises:**

**262:** 24, 25, 28, 32  
**271:** 6, 8, 17, 21, 29, 38  
**300:** 7 – 9, 19, 23  
**315:** 1, 4

**Wed., Mar. 19:**

**Read:** § 5.1

**Exercises:**

**227:** 24, 26, 34

**248:** 38, 41, 46, 49

**262:** 22, 26, 30

**271:** 15, 16, 20, 28

**300:** 1 – 5

**Mon., Mar. 17:**

**Read:** § 4.3

**Exercises:**

**228:** 31 – 33

**248:** 8, 9, 16, 17, 20, 21, 25, 33

**261:** 4, 8, 13, 15 – 21

**271:** 2, 5

**Fri., Mar. 14:**

**Read:** §§ 4.1, 4.2

**Exercises:**

**227:** 23

**236:** 9, 10, 14, 15

**248:** 4, 7, 10 – 12, 15, 19

**261:** 3, 7

**Wed., Mar. 12:**

**Midterm Test**

**Mon., Mar. 10:**

**Review Session.** Bring questions.

Be sure to **obtain a copy** of the handout<sup>2</sup> (also available as PDF<sup>3</sup> or DVI<sup>4</sup>) that supplements the class of Fri., Feb 28.

**Recess** Mar. 1 – Mar. 9

**Fri., Feb. 28:**

**Read:** § 3.5

**Exercises:**

**203:** 34, 35, 37, 38, 41, 42

**211:** 12, 21

**226:** 10 – 12, 20, 21

**236:** 1 – 8, 11, 12

**Wed., Feb. 26:**

**Read:** § 3.4

**Exercises:**

**152:** 33

**190:** 25

**201:** 29 – 32, 40

**211:** 6 – 9, 11, 19

**226:** 1 – 5, 16, 17

**Mon., Feb. 24:**

**Read:** § 3.3

**Exercises:**

**152:** 19, 20, 25, 26, 29, 31

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<sup>2</sup>URI: la030228.html

<sup>3</sup>URI: la030228.pdf

<sup>4</sup>URI: la030228.dvi

**190:** 23, 24  
**201:** 19 – 22, 25, 27, 28  
**211:** 1 – 5, 10

**Fri., Feb. 21:**

**Read:** § 3.2

**Exercises:**

**152:** 21 – 24  
**189:** 3, 16 – 18  
**201:** 1 – 6, 8, 9, 11 – 14

**Wed., Feb. 19:**

**Read:** § 3.1

**Exercises:**

**135:** 31, 37  
**140:** 5, 6, 14, 15, 17, 21  
**152:** 9, 10, 14 – 16  
**189:** 1, 2, 9 – 15

**Mon., Feb. 17:**

President's Day Recess: **no class**

**Fri., Feb. 14:**

**Read:** § 2.3

**Exercises:**

**100:** 45, 46  
**135:** 24, 25, 27, 28, 32  
**140:** 7, 10, 11, 13, 18 – 20  
**152:** 1 – 8, 13

**Wed., Feb. 12:**

**Read:** § 2.2

**Exercises:**

**100:** 32, 36, 38, 42, 44  
**135:** 11, 13, 14, 16, 22, 23, 26, 30  
**140:** 1 – 4, 12

**Mon., Feb. 10:**

**Expect** at least one quiz this week.

**Read:** § 2.1

If you find § 2.1 opaque, it is likely that you have not fully digested § 1.6.

**Exercises:**

**86:** 33, 34, 38  
**100:** 26, 27, 29, 31, 34, 35  
**134:** 1 – 5, 7, 9, 10, 12

**Fri., Feb. 7:**

**Exercises:**

**68:** 35 – 39, 44, 45, 47, 48  
**84:** 15, 16, 20, 23, 25 – 27, 29, 30  
**99:** 12, 13, 16, 17, 19, 23 – 25

**Wed., Feb. 5:**

**Read:** § 1.6

**Exercises:**

**48:** 45, 46  
**68:** 26, 27, 29, 30 – 34, 43, 56  
**84:** 9, 10, 11, 13  
**99:** 1 – 10

**Mon., Feb. 3:**

**Read:** § 1.5

**Exercises:**

**46:** 24, 36, 39, 41

**68:** 11, 12, 23, 25, 42

**84:** 6, 7

**Fri., Jan. 31:**

**Exercises:**

**16:** 21, 23, 27, 32, 35, 38, 39

**31:** 5, 8, 11, 14, 16, 19, 22, 23

**46:** 3, 4, 11, 12, 17 – 19, 23

**Wed., Jan. 29:**

**Read:** Read § 1.3

**Exercises:**

**68:** 3, 4, 5, 7, 8, 9

**Mon., Jan. 27:**

**Read:** §§ 1.1 – 1.2, 1.4

**Exercises:**

**15:** 6, 10, 21, 25

**31:** 4, 11, 12

**68:** 2

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