

- (1) **Homework problems for Class 1** All problems are from Section 12.1.
 - (a) Basic vector geometry: 1, 15, 16, 17, 21, 25, 29.
 - (b) Basic questions on components: 9, 11, 13, 19, 24, 27, 31, 33-36, 46, 47.
 - (c) Linear combination questions: 49, 51, 53, 55, 57
 - (d) Unit vectors: 37-45, 59, 60.
 - (e) **HAND IN PROBLEMS:** hand in solutions to questions 56 and 58 at the start of class on Monday 24th January.
- (2) **Homework for class 2**
 - (a) Basic 3-dimensional vector calculations: Section 12.2, Q 3, 4, 9-17, 19, 21, 23, 25
 - (b) Lines: Section 12.2, Q (27-39 odd), 45, 47, 49
 - (c) Basic dot product questions: Section 12.3 (1-11 odd), 33, 35, 37, 39.
 - (d) Angles between vectors: Section 12.3 (19-31 odd).
- (3) **Homework for class 3**
 - (a) Basic projection calculations: Section 12.3, Q 37-43 (odd)
 - (b) More interesting dot product questions: Section 12.3, Q 57, 59, 61, 69, 73.
 - (c) Basic calculations of the cross product: Section 12.4, Q 1-25 (odd)
 - (d) More interesting cross product questions: Section 12.4, Q 31, 33, 37, 43-55 (odd)
 - (e) **HAND IN PROBLEMS:** Solutions to Section 12.2 Q50, and Section 12.3 Q60 are due at the start of class on Monday 31st January.
- (4) Class 4 was cancelled.
- (5) **Homework for class 5**
 - (a) Routine computations with planes: Section 12.5, Q 1, 3, 5, 11, 13, 15, 17.
 - (b) Basic questions on planes: Section 12.5, Q 21, 22, 23, 25, 26, 27.
 - (c) More interesting questions on planes: Section 12.5, Q 31, 33, 35, 49, 53.
 - (d) More interesting parameterization questions: Section 13.1, Q5, 6, 7, 9, 15, 17.
 - (e) More interesting parameterization questions: Section 13.1, Q18, 19, 25, 29, 30, 31, 33. (*For questions 30 and 33, you might like to review Section 11.1.*)
 - (f) **HAND IN PROBLEMS:** Solutions to Section 12.5 Q46, and Section 13.1 Q36 are due at the start of class on Monday 7th February. In addition, prepare and hand in a one page summary of the material we have covered from sections 12.1-12.5 and 13.1.
- (6) **Homework for class 6**
 - (a) Routine computations with vector calculus: Section 13.2, Q 1, 3, 5, 11, 13, 15, 40, 41, 43.
 - (b) More interesting questions on vector calculus: Section 13.2, Q 16, 23, 24, 31, 33, 35, 37, 49, 51, 55.
- (7) **Homework for classes 7 & 8**
 - (a) Routine calculations on arc length: Section 13.3 Q 1, 3, 9, 11, 13, 14, 16, 19
 - (b) Other questions on arc length: Section 13.3 17, 22, 23, 25
 - (c) Routine calculations on curvature: Section 13.4 Q 1, 3, 5, 7, 9, 11, 13
 - (d) Other questions on curvature: Section 13.4 19, 21, 23, 24, 34, 35

- (8) **Homework for class 9**
- (a) Motion in 3-space: Section 13.5 Q3, 15, 17, 29, 31, 33, 42, 44, 45, 46.
 - (b) multivariate functions: Section 14.1 Q 1, 3, 5, 7, 13, 20, 21, 23, 27, 35, 37, 39, 41, 44, 47.
 - (c) **HAND IN PROBLEMS:** hand in solutions to questions S13.4 Q32 and S14.1 Q33 at the start of class on Monday Feb 21st.
- (9) **Homework for class 10**
- (a) Questions on the interpretation of partial derivatives: Section 14.3, Q 7-11, 49
 - (b) Do as many of the following routine computational questions on partial derivatives that you need to. Be sure to try a selection of questions of different types. Section 14.3: 12-45, Section 14.4 11-18.
- (10) **Homework for class 11**
- (a) Do as many of the following routine computational questions on higher order partial derivatives that you need to. Be sure to try a selection of questions of different types. Section 14.3: 53-58, 63-70.
 - (b) Limits and continuity: Section 14.2, Q 3, 5, 9, 17, 21, 23, 31, 32, 34, 35.
- (11) **Homework for class 12**
- (a) Linearization: Section 14.4 Q 1, 3, 5, 7, 9, 22, 27, 35, 38.
 - (b) The gradient: Section 14.5 Q 1, 3, 5-8, 61.
- (12) **Homework for class 13**
- (a) The chain rule for paths: Section 14.5 Q 9, 13, 14, 37.
 - (b) Directional derivatives and the gradient: Section 14.5 Q Preliminary Questions, 23, 27, 29, 31, 33, 35, 39, 40, 43, 64.
- (13) **Homework for class 14**
- (a) The chain rule: Section 14.6 (Preliminary Questions 2,4,5), Q 1, 5, 9, 15, 17, 20, 31, 34, 35.
- (14) **Homework for class 15**
- (a) Optimization: Section 14.7 Q 2, 3, 5, 7, 25, 30, 35, 37, 39, 42.
 - (b) **HAND IN PROBLEMS:** hand in solutions to questions S14.6 Q30 and S14.7 Q 8 & 32 on Monday 21st March.
- (15) **Homework for class of March 21st**
- (a) Riemann sums: Section 15.1 Q 3, 5, 8, 9, 12.
 - (b) Iterated integrals: Section 15.1 Q 17, 23, 25, 27, 35, 37, 39.
 - (c) **HAND IN PROBLEMS:** For Wednesday March 23rd, prepare solutions to Section 15.1 Q 6, 30, 36. It will be announced at the beginning of class which one of your three solutions is to handed in for grading.
- (16) **Homework for class of March 23rd**
- (a) Double integrals: Section 15.2 (PQ 1,2,3) Q 1, 4, 5, 9, 15, 21, 25, 29, 33, 37, 51, 55, 60
 - (b) Triple integrals: Section 15.3 (PQ 1) Q 5, 7.
 - (c) **HAND IN PROBLEMS:** For Monday March 28th, prepare solutions to Section 15.2 Q 4, 10, and Section 14.5 Q34. It will be announced at the beginning of class which one of your three solutions is to handed in for grading.
- (17) **Homework for class of March 28th**
- (a) Triple integrals: Section 15.3 Q 11, 13, 15, 17, 18, 23, 25, 29.

- (b) Cylindrical and spherical coordinates: Section 12.7: Q1, 5, 11, 17, 19, 21, 25, 27, 31, 41, 43, 45, 49, 51, 55
 - (c) **HAND IN PROBLEMS:** For Wednesday March 30th, prepare solutions to Section 14.6 Q 18, and Section 15.3 Q18, 24. It will be announced at the beginning of class which one of your three solutions is to handed in for grading.
- (18) **Homework for class of March 31st**
- (a) Cylindrical and spherical coordinates: Section 12.7: Q1, 5, 11, 17, 19, 21, 25, 27, 31, 41, 43, 45, 49, 51, 55
 - (b) Integration in polar, cylindrical and spherical coordinates: Section 15.4 Q: 7, 13, 15, 21, 27, 31, 33, 39, 41, 43, 45, 51, 53.
- (19) **Homework for class of April 4th**
- (a) Mappings Section 15.5 Q 1,3.
 - (b) **HAND IN PROBLEMS:** For Wednesday April 6th, prepare solutions to Section 15.4 Q 22, 32, Section 15.5 Q2, and Section 13.5 Q34. It will be announced at the beginning of class which one of your three solutions is to handed in for grading.
- (20) **Homework for class of April 6th**
- (a) Change of variables Section 15.5 Q 13, 15, 19, 21, 23, 29, 33.
 - (b) Vector fields: Section 16.1 PQs & Q1, 7, 9, 13, 14-21, 23, 25, 27.
 - (c) **HAND IN PROBLEMS:** For Monday April 11th, prepare solutions to Section 15.5 Q 22, 32, and Section 16.1 Q 8, 24. It will be announced at the beginning of class which one of your three solutions is to handed in for grading.
- (21) **Homework for class of April 11th**
- (a) Line integrals: Section 16.2 PQs & Q 1, 5, 9, 13, 15, 17, 19, 23, 25, 29, 31, 41, 49.
 - (b) **HAND IN PROBLEMS:** For Wednesday April 13th, prepare solutions to Section 16.2 Q 10, 20, 32, 42. It will be announced at the beginning of class which one of your three solutions is to handed in for grading.
- (22) **Homework for class of April 13th**
- (a) Conservative vector fields: Section 16.3 PQs & Q1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 23, 25.
- (23) **Homework for class of April 18th**
- (a) Green's Theorem: Section 17.1 PQs & Q1, 2, 3, 5, 7, 9, 11, 13, 15, 20, 28, 29.
- (24) **Homework for class of April 20th**
- (a) Surface integrals: Section 16.4 Q1, 1, 2, 3, 5, 7, 9, 17, 19, 21, 23, 29.
- (25) **Homework for class of April 25th**
- (a) Surface integrals of vector fields: Section 16.5 Q1, 5-17(odd), 20, 23, 27.
- (26) **Homework for class of April 27th**
- (a) Stokes' Theorem: Section 17.2 Q 1-9(odd), 10-14.
 - (b) The Divergence Theorem: Section 17.3 Q 1-19(odd)