

Study Guide for Final Exam

1. You are supposed to know the basics of the 3-dimensional geometry:
 - (1) Equation of a line, a sphere in the 3-dimensional space
 - (2) Dot product and its geometric meaning
 - Orthogonal projection of a vector onto another
 - (3) Cross product and its geometric meaning
 - How to compute the area of a parallelogram formed by two vectors
 - How to compute the volume of a parallelepiped formed by three vectors

Example Problems

- 13.2.27
- 13.3.37
- 13.4.30
- 13.4.64
- 13.5.20

2. You are supposed to know the basics of the polar coordinates and how to carry out the calculus in terms of the polar coordinates, in relation to the Cartesian coordinates. Total of 5 problems will be given in the Final Exam in the subject of the polar coordinates.

- (1) Curves (lines and circles) represented by the polar equations
- (2) How to compute the derivative in terms of the polar coordinates
- (3) How to compute the area in terms of the polar coordinates
- (4) How to compute the arc length in terms of the polar coordinates

Example Problems

- 12.2.42
- 12.2.43
- 12.2.47
- 12.2.48
- 12.3.12
- 12.3.13
- 12.3.39
- 12.3.67

3. You are supposed to know how to compute the volume
 - (1) by the Washer method
 - (2) by the Shell method
 - (3) by knowing the shape of the base and its cross sections

Example Problems

- 6.3.14
- 6.3.15
- 6.3.33
- 6.3.36
- 6.3.37
- 6.4.9
- 6.4.10
- 6.4.13

4. You are supposed to be able to compute the area of a surface obtained by revolution.

Example Problems

- 6.6.17
- 6.6.33

5. You are supposed to be able to compute the work needed

- (1) to lift the chan,
- (2) to pump out the water from a tank of various shape, etc.

Example Problems

- 6.7.31
- 6.7.39

6. You are supposed to be able to use Integration by Parts.

Example Problems

- 8.2.9
- 8.2.10
- 8.2.12
- 8.2.13

7. You are supposed to know

- (1) how to integrate the product of the powers of $\sin x$ and $\cos x$,
- (2) how to integrate the product of the powers of $\tan x$ and $\sec x$.

Example Problems

- 8.3.9
- 8.3.11
- 8.3.13
- 8.3.14
- 8.3.15
- 8.3.27
- 8.3.34
- 8.3.35

8. You are supposed to be able to use the trigonometric substitution.

Example Problems

- 8.4.11
- 8.4.16
- 8.4.19
- 8.4.22
- 8.4.25
- 8.4.26

9. You are supposed to know how to decompose a fraction into partial fractions, and how to use the decomposition to compute the integration of the given fraction.

Example Problems

- 8.5.24
- 8.5.26
- 8.5.29

10. You are supposed to be able to determine whether the given improper integral diverges or converges, and in case it converges, you are supposed to be able to evaluate its value.

Example Problems

- 8.9.12
- 8.9.18
- 8.9.27

11. You are supposed to understand properly the logical conclusion of the Divergence Test.

Example Problems

- 10.4.9
- 10.4.10
- 10.4.11
- 10.4.12
- 10.4.13

12. You are supposed to be able to use the Integral Test to judge the convergence or divergence of the given series.

Example Problems

- 10.4.21
- 10.4.22
- 10.4.33

13. You are supposed to be able to use the Alternating Series Test properly.

Example Problems

- 10.6.25
- 10.6.26

14. You should be able to use the various and appropriate tests to judge the convergence or divergence of the given series.

Example Problems

- 10.8.85
- 10.8.88
- 10.8.93

15. You should be able to derive the Taylor series centered at the given points, by modifying the typical examples of the power series for the functions listed in Table 11.5 in the textbook (you do not have to know $\sinh x$, $\cosh x$ or $(1+x)^p$). You are also supposed to be able to determine its interval of convergence. Also, given the Taylor series, you should be able to tell what function is represented by the series.

Example Problems

- 11.2.66
- 11.2.70