San Francisco State University  
Department of Mathematics  
Course Syllabus  

MATH 475  
Capstone Course for Secondary Teachers  

Prerequisites  
Math 335 and concurrent enrollment in Math 370, or consent of instructor.  

Bulletin Description  
This course builds on students’ work in upper division mathematics to deepen their understanding of the mathematics taught in secondary school. Students will actively explore topics in algebra, analysis, geometry and statistics.  

Course Objectives  
This course builds on students’ work in upper division mathematics to deepen their understanding of the mathematics taught in secondary school. An example of such work would be using ideas from abstract algebra to show that one cannot trisect an angle with ruler and compass. Students might use methods of analysis to explore and connect occurrences of the number $e$ in very different areas of mathematics. Students will actively explore all topics in the course and present their findings orally and in writing. In addition to deepening students’ understandings of key concepts, emphasis will be placed on developing strong communication skills and skills in solving problems.  

Other possible connections to re-examine high school mathematics:  
- arithmetic (e.g. revisited with knowledge of basic number theory, shedding light on phenomena like multiplication patterns and decimal expansions);  
- basic algebra (e.g. revisited with knowledge of modern algebra to better understand polynomial manipulations; revisited with knowledge of calculus and analysis to understand the central role of linearity and linear approximation; revisited with knowledge of fundamental theorem of algebra and complex numbers);  
- geometry (e.g. revisited with advanced Euclidean geometry knowledge and more rigorous notions of proof);  
- precalculus and calculus (e.g. revisited with knowledge of advanced calculus and analysis to better understand the theoretical basis for limit arguments and integrability and differentiability).
Evaluation of Students

Students are graded on their ability to write clear explanations and proofs and to solve problems in the content area of the course. Their grade will be based on regular problem sets, a group project, oral reports on class work, and in-class or take-home examination and a final examination.

Course Outline

<table>
<thead>
<tr>
<th>Topics</th>
<th>Number of Weeks</th>
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</thead>
<tbody>
<tr>
<td>Topics from abstract algebra</td>
<td>4</td>
</tr>
<tr>
<td>Topics from linear algebra</td>
<td>2</td>
</tr>
<tr>
<td>Work with functions</td>
<td>2</td>
</tr>
<tr>
<td>Topics from real and complex analysis</td>
<td>4</td>
</tr>
<tr>
<td>Topics from probability and statistics</td>
<td>2</td>
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</tbody>
</table>