These are only a few sample problems to *help* you prepare for the exam. You should also be certain that you completely understand the assigned homework, in-class work, and your class notes.

1. Let $f(x) = \begin{cases} x & \text{if } x \leq 2 \\ -x+6 & \text{if } x > 2 \end{cases}$

   Graph $y = f(x)$.

   (a) Does f satisfy the **hypotheses** of the IVT on $[-4, 3]$? on $[-4, 0]$? on $[1, 5]$?

   (b) Does f satisfy the **conclusion** of the IVT on $[-4, 3]$? on $[-4, 0]$? on $[1, 5]$?

2. If $F(x) = \displaystyle\int_0^x \frac{t}{\sqrt{1-t^2}}\, dt$, find the equation of the tangent line to $y = F(x)$ at $x = \frac{1}{2}$.

3. Draw the graph of a function that does not satisfy the conclusion of the Extreme Value Theorem on the interval $[1, 3]$. Explain.

   Is your function continuous on the interval $[1, 3]$?

4. Let $f(x) = (2x-6)e^x$, $a = 1$, and $A_f(x) = \displaystyle\int_a^x f(t)\, dt$.

   (a) Where is A_f increasing? decreasing?

   (b) Identify all local maxima and minima of A_f.

   (c) Where is A_f concave up? concave down?

   (d) Use all of this information to *sketch* a graph of $y = A_f(x)$.

   (e) How would your graph change if $a = 3$?

5. Let $f(x) = 18\cos(x) - 17x$. Show that f has a root between $x = 0$ and $x = \frac{\pi}{2}$. Approximate the value of the root accurate within 0.1 of its actual value.

6. In your own words, give an intuitive justification for why the IVT and the MVT are true.

7. Be sure to review all of the assigned homework problems, and *pay attention to any types of problems that may not be represented here*, especially to the homework from Section 5.4 that isn't collected.