1. (*See examples and exercises in* §2.2 and §2.6.) Give an example of a graph $y = f(x)$ with a vertical asymptote at $x = -1$ and a horizontal asymptote at $y = 2$.

2. (*See* §3.4.) Build an example of a complicated chain rule derivative question. That is, write down $f(x)$ and compute the derivative $f'(x)$.

3. (*See* §5.5.) Write the previous example as an indefinite integration question. Give a substitution which will solve it. Complete the integration.

Some advice for the actual Final Exam:

Read the question. Don't just guess it is of a certain type.

4. (*See* §4.7.) A steel cylindrical can is to hold 1 L of oil. Find the dimensions of the can that will minimize the amount of steel.

5. (*See* §5.1 and §5.2.) For the integral $\int_0^6 \frac{1}{1+x^4}\,dx$, compute the Riemann sums with $n = 3$ rectangles and both left and right endpoints.

6. (*See* §4.3 and §4.5.) Find the critical points, intervals of increase and decrease, and points of inflection of $f(x) = x^3 - 3x - 1$. Then sketch the graph $y = f(x)$.

7. (*See* §4.8.) In the graph above there is a solution of $f(x) = 0$ near $x = 2$. Approximate it using one step of Newton's method, and add that to your sketch.

8. (*See* §3.5.) Find dy/dx by implicit differentiation: $y \cos x = x^2 + y^2$