Math 130 Precalculus Fall 14 Sample midterm 2

1. Find the maximum value of the function $f(x) = x - 4 - 8x^2$ by completing the square.

2. A segment of a rain gutter is made from a square sheet of metal with sides of length 60cm, by folding the square along two lines equal distance from the sides. What is the largest volume of the rain gutter that may be made?
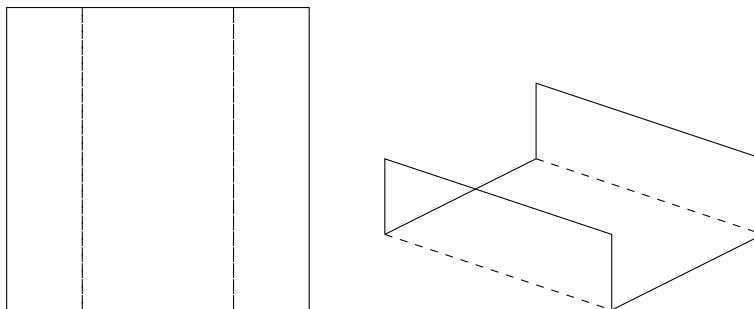

Figure 1: Fold along the dashed lines.

3. Sketch the graph of the function $f(x) = x^4 + x^3 - 6x^2$.

4. Sketch the graph of the function $f(x) = \dfrac{x^2 + 4}{x^2 - 4}$.

5. Write $\dfrac{(1 + 2i)(3i - 1)}{2i - 3}$ in the form $a + bi$, where a and b are real.

6. Find all roots of the polynomial $x^4 - 2x^2 - 8$.

7. Sketch the graph of $f(x) = e^x$. Use transformations to sketch $f(x) = e^{-2x} - 4$.

8. Sketch the graph of $f(x) = \ln(x)$. Use transformations to sketch $f(x) = 3\ln(x + 2)$.

9. You deposit $200 in a bank account with an interest rate of 4%.

    (a) How much will there be after 3 years if the interest is compounded annually?

    (b) How much will there be after 3 years if the interest is compounded continuously?

    (c) If the interest is compounded annually, how long will it be before you have $300?

10. Simplify

    (a) $\log_4\left(\frac{1}{2}\right)$

(b) $\ln\left(\frac{1}{e}\right)$

(c) $\ln\left(a^3 b^4 / \sqrt[3]{c}\right)$

(d) $\ln\left(\sqrt{\dfrac{x+1}{x-1}}\right)$

(e) $\ln\left(\sqrt{a\sqrt{b}}\right)$

11. Find the inverse function for $f(x) = \ln(3x/5)$.

12. Solve the following equations.

   (a) $4^{2x+1} = 5^{3x}$

   (b) $\log_2(x-2) + \log_2(x+1) = 2$

   (c) $3\ln(5-x) = 2$