Problem 1. Sketch the graphs of the following function.

1. * $f(x) = x^4 - 4x$.
2. * $f(x) = \dfrac{1}{x^2 - 4}$.
3. * $f(x) = \dfrac{x - 1}{x^2}$.
4. $y = 1 + \dfrac{1}{x} + \dfrac{1}{x^2}$.
5. $f(x) = \sin x + \sqrt{3}\cos x\,, \quad -2\pi \le x \le 2\pi$.
6. $f(x) = \dfrac{x}{x^3 - 1}$.

Problem 2. If $C(x) = 16,000 + 500x - 1.6x^2 + 0.004x^3$ is the cost function and $p(x) = 1700 - 7x$ is the demand function, find the production level that will maximize profit.

Problem 3. If you are offered one slice from a round pizza (in other words, a sector of a circle) and the slice must have a perimeter of 32 inches, what diameter pizza will reward you with the largest slice?

Problem 4. A fence 8 ft tall runs parallel to a tall building at a distance of 4 ft from the building. What is the length of the shortest ladder that will reach from the ground over the fence to the wall of the building?

Problem 5. What is the minimum vertical distance between the parabolas $y = x^2 + 1$ and $y = x - x^2$?

Problem 6. If 1200 cm^2 of material is available to make a box with a square base and an open top, find the largest possible volume of the box.

Problem 7. * Find the points on the ellipse $4x^2 + y^2 = 4$ that are farthest away from the point $(1, 0)$.