

1. 15 pts. A suspension bridge with weight uniformly distributed along its length has twin towers that extend 75 meters above the road surface and are 400 meters apart. The cables are parabolic in shape and are suspended from the tops of the towers. The cables touch the road surface at the center of the bridge (midway between the towers). Find the height of the cables at a point 100 meters from the center. Assume the road is level.
2. 10 pts. Find the complex zeros of $f(x) = -2x^2 + 8x + 1$.
3. 10 pts. Solve $5 - \left| \frac{x}{2} \right| = 3$.
4. 10 pts. Solve $|1 - 4x| - 8 > -2$ and write the solution in interval notation.
5. 10 pts. Construct a polynomial function of degree 5 having zeros 0 (with multiplicity 2), 2 (with multiplicity 1), and -1 (with multiplicity 2), and whose graph contains the point $(1, 4)$. Do not bother to expand the product.
6. 10 pts. Construct a polynomial function of degree 3 having real coefficients and zeros -4 and $2 + i$. Expand the product to write the polynomial in standard form.
7. 15 pts. Using synthetic division and pertinent theorems, find all solutions (real or complex) to the equation

$$x^4 + 6x^3 + 7x^2 - 6x - 8 = 0.$$

Also give the full factorization of the polynomial in the equation.
8. 10 pts. Find all asymptotes for the rational function

$$\Omega(x) = \frac{x^3 + 3x^2}{x^2 - 4}.$$
9. 10 pts. each Solve each inequality algebraically, writing the solution set in interval notation.

 - (a) $x^2 < x + 2$
 - (b) $\frac{x}{x + 1} \geq 3x$
10. 10 pts. For what positive numbers, if any, will the cube of a number be at most eight times its square?