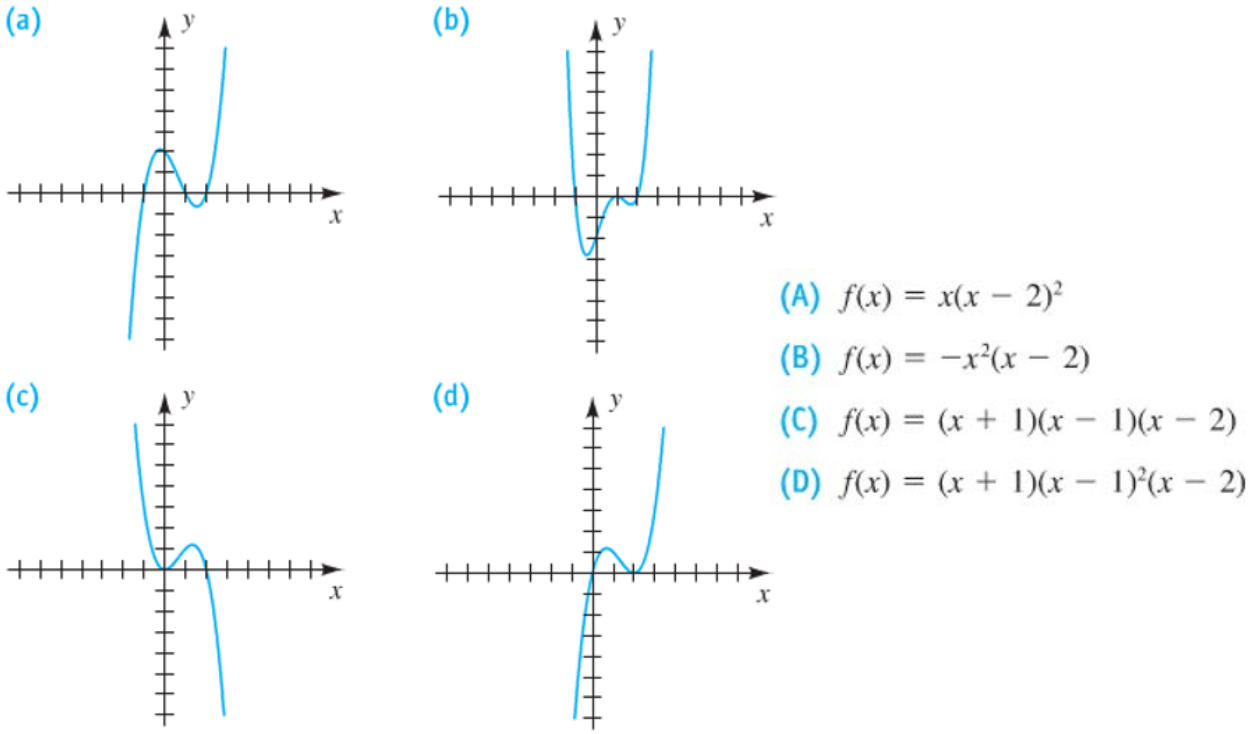
1. Match each graph with an equation and state any local maximums or minimums that you can find.



2. A polynomial $f(x)$ is given in standard and factored form. Graph it and state solutions to **i)** $f(x) = 0$ (including multiplicities), **ii)** $f(x) \geq 0$, and **iii)** $f(x) < 0$.

   a) $f(x) = x^3 + 4x^2 - 11x - 30 = (x-3)(x+2)(x+5)$

   b) $f(x) = 4x^4 + 27x^3 - 42x^2 = (x+5)^2(4x+3)(x-4)$

   c) $f(x) = -x^4 - 4x^3 + 3x^2 + 18x = x(2-x)(x+3)^2$

3. Use The Intermediate Value Theorem to show that f has a zero between a and b.

   a) $f(x) = x^3 - 4x^2 + 3x - 2; \quad a = 3, \ b = 4$

   b) $f(x) = 2x^3 + 5x^2 - 3; \quad a = -3, \ b = -2$

   c) $f(x) = -x^4 + 3x^3 - 2x + 1; \quad a = 2, \ b = 3$

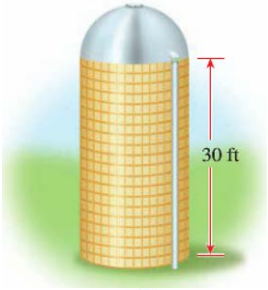
4. Sketch a graph of $f(x) = (x-a)^2(x-b)(x-c)$, where $a < b < 0 < c$.

   a) What is the *y*-intercept?

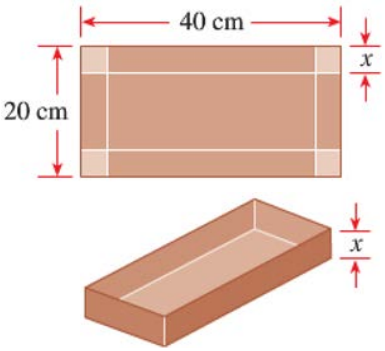
   b) What is the solution to $f(x) > 0$?

   c) What is the solution to $f(x) \leq 0$?

5. **Volume of a Silo** A grain silo consists of a cylindrical main section and a hemispherical roof. If the total volume of the silo (including the part inside the roof section) is 15,000 ft^3 and the cylindrical part is 30 ft tall, what is the radius of the silo, rounded to the nearest tenth of a foot?



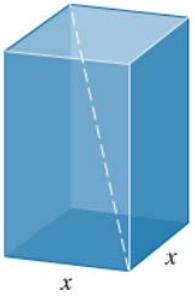
6. **Volume of a Box** An open box with a volume of 1500 cm^3 is to be constructed by taking a piece of cardboard 20 cm by 40 cm, cutting squares of side length x cm from each corner, and folding up the sides. Show that this can be done in two different ways, and find the exact dimensions of the box in each case.



7. **Volume of a Box** A rectangular box with a volume of $2\sqrt{2}$ ft^3 has a square base as shown below. The diagonal of the box (between a pair of opposite corners) is 1 ft longer than each side of the base.

(a) If the base has sides of length x feet, show that

$$x^6 - 2x^5 - x^4 + 8 = 0$$



(b) Show that two different boxes satisfy the given conditions. Find the dimensions in each case, rounded to the nearest hundredth of a foot.