Round Five:

A. $(2x + 5)^2 \le 0$ only if $(2x + 5)^2 = 0$ so $2x + 5 = 0$, $x = -2.5$

B. $x^2 - 13x = 30$ so $(x - 10)(x - 3) = 0$ or $x^2 - 13x = -30$ so $(x - 15)(x + 2) = 0$ sum is $10 + 3 + 15 - 2$

C. By synthetic division testing or calculator table $x-2$ is a factor of $13x^3 - 50x^2 + 44x + 8 = (x - 2)(x - 2)(13x + 2)$ If $x \neq 2$ first two are positive product so $13x + 2 > 0$ if $x > -2/13$

Round Six:

A. $1/(6/5) = 5/6$

B. If $x/y = ¼$ then $y = 4x$. Substitute to get $(4x - 12x)/(2x + 4x) = -8x/6x$

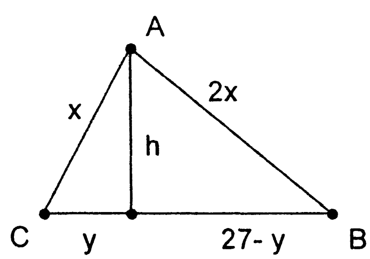
C. $$M = 7 + \cfrac{6}{1 + \cfrac{2}{5 + \cfrac{4}{3}}} = 7 + \cfrac{6}{1 + \cfrac{2}{19/3}} = 7 + \cfrac{6}{1 + \cfrac{6}{19}} = 7 + \frac{6(19)}{25} = \frac{289}{25}$$

Similarly $$N = 1 + \cfrac{2}{7 + \cfrac{6}{3 + \cfrac{4}{5}}} = \frac{201}{163} \text{ so } M - N = \frac{289(163) - 201(25)}{25(163)} = \frac{42082}{4075}$$

Team Round:

A. Centers of balls form reg. tetrahedron of edge 4. Altitude hits base incenter 2/3 way from vertex so ht $= \sqrt{4^2 - \left(\frac{2}{3} \cdot 2\sqrt{3}\right)^2} = \frac{4\sqrt{6}}{3}$ Add on radius of top ball and bottom layer.

B. $x^2 = h^2 + y^2$ and $4x^2 = h^2 + y^2 + 729 - 54y$ subtracting gives $3x^2 = 729 - 54y$ or $x^2 = 243 - 18y$ with x^2 a perfect square by trial and error or calculator table y is 1, $x^2 = 225$ or $y = 9$, $x^2 = 81$. Only the first fits the problem so $h = \sqrt{225 - 1} = 4\sqrt{14}$



C. $x = y/2$ so subst. to get $2/y + ½ + 6/z = 14 - y$ so $6/z = 27/2 - y - 2/y =$ $$\frac{27y - 2y^2 - 4}{2y} \text{ so } \frac{z}{6} = \frac{2y}{-2y^2 + 27y - 4} \text{ and } z = \frac{12y}{-2y^2 + 27y - 4}$$

D. $1/b + 1/a = 1/10$; $1/m + 1/a = 1/8$; $1/m = 1/B = 1/6$; sum to get $2/b + 2/a + 2/m = 47/120$ so together $1/b + 1/a + 1/m = 47/240$. After 2 hrs. 4/5 job remains. 4/5 divided by $47/240 = 4\frac{4}{47} \approx 4\frac{4}{48} = 4hrs5\min$

E. The minimum value will occur at a vertex of the graph where one of the two AV expressions is zero and the minimum value is just the other expression. If the first