6. [10 points]

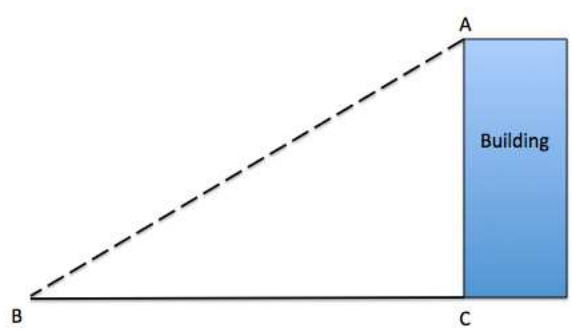
a. [5 points] The temperature T (in degrees Fahrenheit) at a point next to a campfire is inversely proportional to the square of its distance d (in meters) from the fire. If the temperature at a point 0.5 meters away from the fire is 500° F, what is the temperature (in degrees Fahrenheit) at 1.5 meters away from the fire? Show all your work to receive full credit.

Solution: $T = \dfrac{k}{d^2}$ so $500 = \dfrac{k}{0.5^2}$ and $k = 500(0.5)^2 = 125$.
Thus the temperature at 1.5 meters is $T = \dfrac{125}{1.5^2} \approx 55.56°$ F

b. [2 points] Let $H(x) = (x^3+1)^2$. Find two functions $K(x)$ and $J(x)$ such that $K(J(x)) = H(x)$. Your functions should satisfy $K(x) \neq x$ and $J(x) \neq x$.

Solution: $K(x) = x^2 \qquad J(x) = x^3+1$ or $K(x) = (x+1)^2 \qquad J(x) = x^3$

c. [3 points] The shadow (the segment BC) made by a 150-foot-tall building has a length of 200 feet. Find the value, in **radians**, of the angle ABC.



Solution: Let θ = angle ABC, then $\tan\theta = \frac{150}{200}$. Hence $\tan^{-1}(\frac{150}{200}) \approx 0.643$ radians.