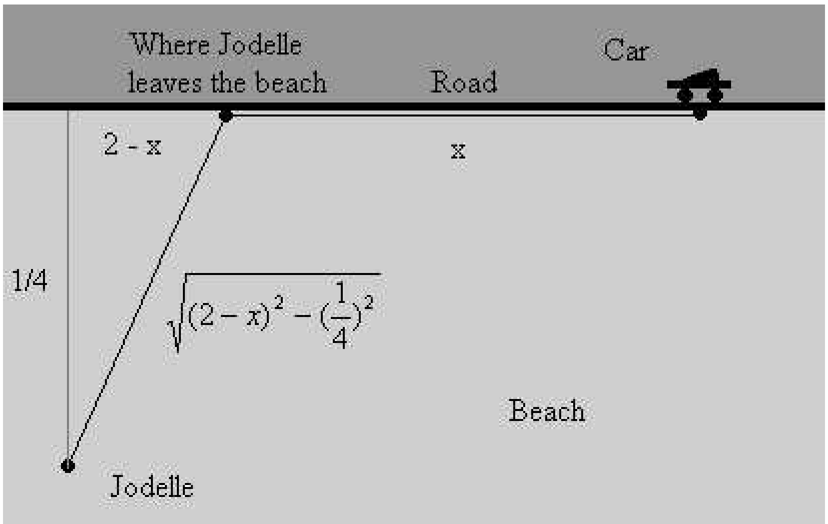
Jodelle has been beach walking and now wants to return to her car. She walks 1 mile per hour on the beach and 4 miles per hour on the road. She wants to get to her car as quickly as possible when she is ¼ mile from the road and 2 miles along the road to her car. What route should she take to return to her car the quickest?

DRAW A PICTURE



$R \cdot T = D$ so, $T = \frac{D}{R}$

So, we have the function $T(x) = \frac{\sqrt{(2-x)^2-(\frac{1}{4})^2}}{1} + \frac{x}{4}$

Which simplifies to $T(x) = \sqrt{(2-x)^2 - \frac{1}{16}} + \frac{x}{4}$

The derivative is $T'(x) = \frac{-(2-x)}{\sqrt{(2-x)^2 - \frac{1}{16}}} + \frac{1}{4}$

Solving for the critical values, we have $4(2-x) = \sqrt{(2-x)^2 - \frac{1}{16}}$

Which implies that $16(4-4x+x^2) = (2-x)^2 - \frac{1}{16}$

Or $15(4-4x+x^2)-\frac{1}{16}=0$ which when distributed is $15x^2-60x+60-\frac{1}{16}=0$

Which simplifies to the quadratic $15x^2-60x+\frac{959}{16}=0$

The quadratic formula tells us that $x=\frac{120\pm\sqrt{15}}{60}$.

Since these numbers don't mean much to us, we will look at the decimal *approximations* $x\cong 1.93545$ or $x\cong 2.06455$. Only the first of these values is reasonable, so we have that Jodelle walks along the road for about 1.93 miles.