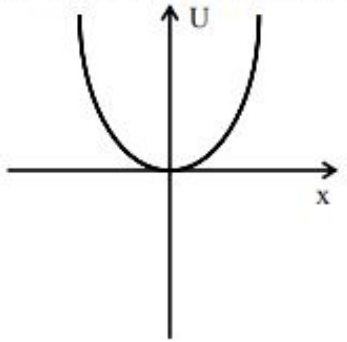
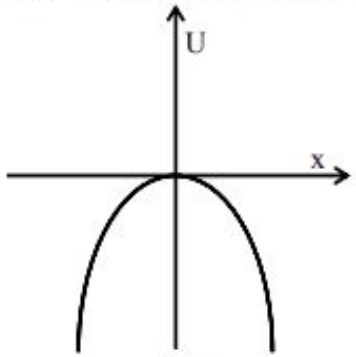
34*. A particle is acted by a force F = kx, where k is a +ve constant. Its potential energy at x = 0 is zero. Which curve correctly represents the variation of potential energy of the block with respect to x

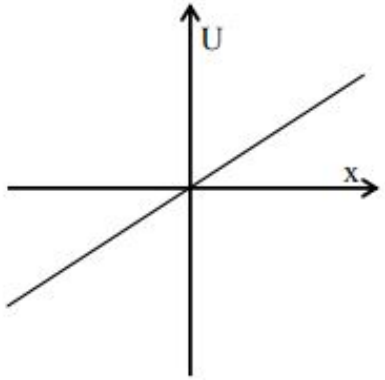
(A)



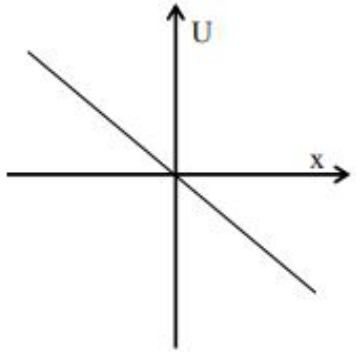
(B)



(C)



(D)



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GIVEN FORCE = kx, $U(0)=0$, so, now we know that for a conservative force, we have,

$$F = -\frac{dU}{dx} \Rightarrow kx = -\frac{dU}{dx} \Rightarrow dU = -kx\,dx$$

$$U = -\frac{1}{2}kx^2 + C$$

Now at $x=0$, $U=0$

so, $C=0$

$$\boxed{U = -\frac{1}{2}kx^2}$$ ← Parabola.

for any value of 'x' we will have 'U' to be negative

so, on this fact we can say that answer is option (B)