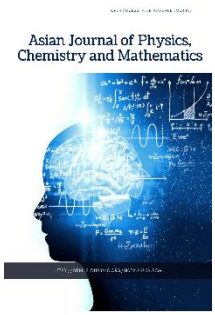

Some Methodological Features of Teaching the Subject «Higher Mathematics» in Higher Educational Institutions

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ABSTRACT

This article discusses the training of modern specialists who meet modern requirements, the ability to build a mathematical model in the process, the use of modern technologies in obtaining solutions. The growth in the use of highly efficient technologies in production sets the task for teachers to prepare professionally competent, competitive specialists. The mechanism of constructing a mathematical model in solving problems, the use of the mathematical apparatus, the analysis of the results obtained, the use of the Maple software in solving the problem are considered.

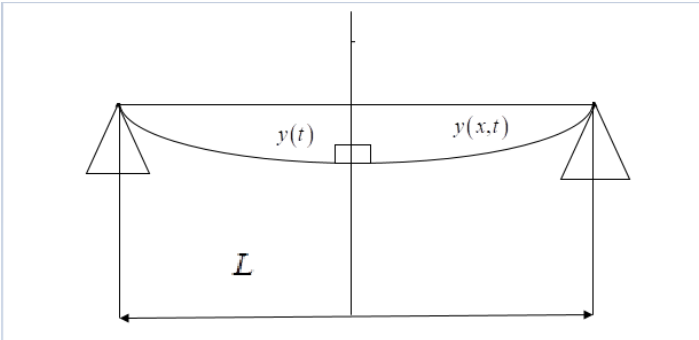
Keywords: Elastic beam, perforator, mathematical apparatus, mass, spring, Mathcad software system, quality of education, vibration amplitude, rotational frequency, time, initial phase.

The quality of education is the most important indicator in teaching. To improve the quality of knowledge in the field of "Higher Mathematics", it is advisable to use interdisciplinary connections. Higher mathematics is taught in the first and second years - it requires significant skills from the teacher in the educational process. In the educational process, the lecturer or practical teacher should introduce the basic concepts based on their knowledge acquired in high school, especially taking into account interdisciplinary connections and integration, activating the educational process using information technology need In particular, the use of mathematical apparatus, the use of information technology in solving simple mechanical problems is very effective.

Below we show the solution to the simplest problems in Mathcad.

Issue 1. The elastic beam is attached to two supports with a perforator in the middle. Calculate the deflection of the beam with respect to the time it has a non-constant mass.

Solution:



With the operation of the perforator, the beam is forced to vibrate. Since the perforator is built on an elastic beam, it can be viewed as a mass hanging from a spring. The forced oscillation of the matter is determined by the formula:

$$y(t) = A\cos(\omega t - \beta)$$

Here:

$A-$ vibration amplitude;

$\omega-$ the rotational frequency;

$t-$ time;

$\beta-$ the initial phase.

In this case the vibration of the beam

$$y(x,t) = y(t)\sin\frac{\pi x}{2}$$

Here:

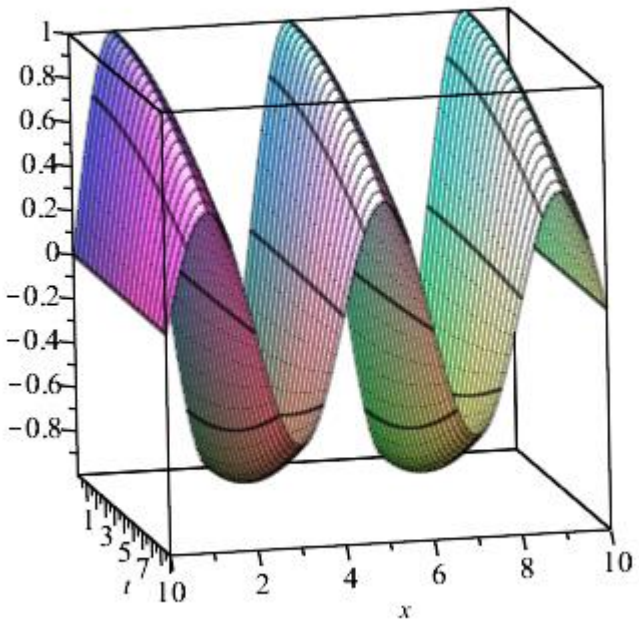
$x-$ the coordinate of the beam shear;

$L-$ the length of the beam.

```
> restart;
> A:=1: omega:=0.1: beta:=0:
> u:=(x,t)->A*cos(omega*t-beta)*sin(Pi*x/2);
```

$$u := (x,t) \mapsto A\cos(\omega t - \beta)\sin\left(\frac{\pi x}{2}\right)$$

```
> with(plots):
> plot3d(u(x,t), t = 0.01 .. 10, x = 0 .. 10, grid = [100, 100]);
```




```
> V0:=49: g:=9.81: H:=t->V0*t-g*t^2/2;
```

$$H := t \mapsto V0\,t - \frac{1}{2}g\,t^2$$

```
> plot(H(t), t = 0.01 .. 10);
```

Issue 2. The object was shot vertically from the ground at a speed of $V = S\ m/s$.

1. What is the maximum height?
2. How long will it take to get back there?

This task is given to students to work independently and to solve through numerical experiments using information technology.

The elevation $H(t) = V_0 t - \frac{g}{2}t^2$ of a body known from a physics course is given by the values of t and S is determined experimentally.

Solution:

Numerical solutions are available in the MathCAD software product.

$V_0 := 49$ $g := 9.81$

$H(t) := V_0 t - \frac{g}{2}t^2$ $t := 0.01..10$

$V_0 := 49$ $g := 9.81$

$H(t) := V_0 t - \frac{g}{2}t^2$

$t := 6$

Given

$t_0 := root(H(t), t) = 9.99$

$V_0 := 49$

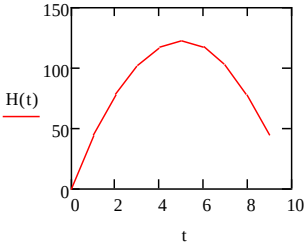
$g := 9.81$

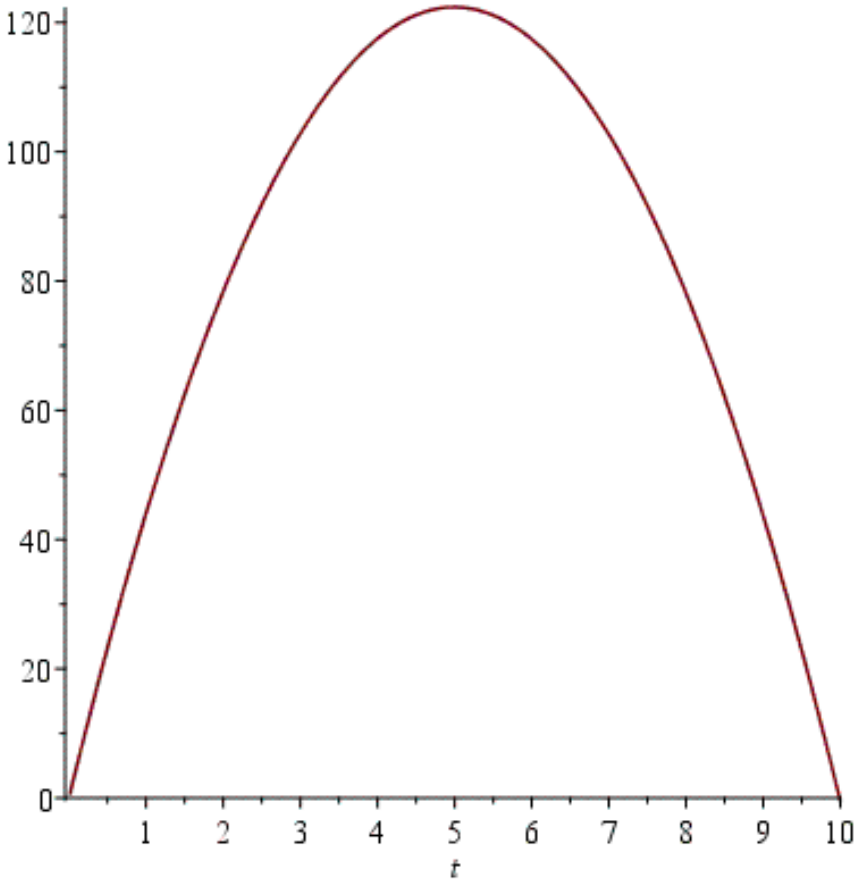
$H(t) := V_0 - \frac{g \cdot t^2}{2}$

$t := 8$

Given

$t := root(H(t), t) = 3.161$





```
> V0:=49: g:=9.81: t:=6: t0:=root(H(t),t);
t0 := 2.212875664
> t:=8: t0:=root(H(t),t);
t0 := 1.724119944
>
```

Conclusion

The use of information technology in improving the quality of lessons in higher mathematics and taking into account interdisciplinary links in the management of students' independent work has led to an increase in professional competencies, which helps to increase the effectiveness of lessons.

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