

How fast was the pen going?

Break-Ground:

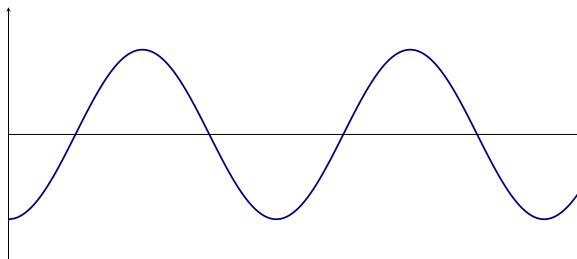
How fast was the pen going?

Two young mathematicians think about the rate of change of periodic motion.

Check out this dialogue between two calculus students (based on a true story):

Devyn: Riley, do you remember your pen bouncing on a spring?

Riley: Sure! I still have the graph of it's height that we made. It looked like this:



Devyn: Did you notice that at the top, the graph looks like it has horizontal tangent lines?

Riley: And at the bottoms, too!

Devyn: Right! That means the pen was at rest at those instants. What about at other points, though?

Riley: The steepest slopes look like they happen when the graph crossed the t -axis. That means the pen was moving fastest at those times.

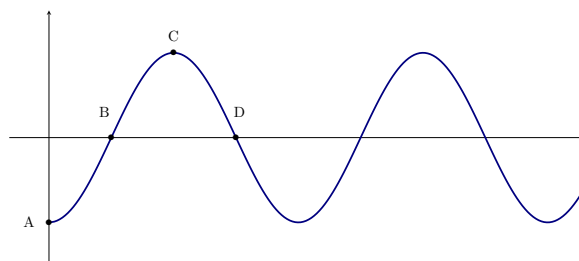
Devyn: How fast was it going though? And what about at other times?

Riley: Hmmmm. I'm not sure yet...

Let's put some labels on the graph so we can talk about it.

Learning outcomes:

How fast was the pen going?



Problem 1 At which of these points does the pen have the highest velocity?
(Choose all that may apply)

Select All Correct Answers:

- (a) A
- (b) B ✓
- (c) C
- (d) D
- (e) None of these.

Problem 2 When x is a small number (near zero), which term of $5x^6 - 5x^5 - 5x^4 + 5x^3 + x^2 - 1$ is largest (furthest from zero)?

Multiple Choice:

- (a) -1 ✓
- (b) x^2
- (c) $5x^3$
- (d) $-5x^4$
- (e) $-5x^5$
- (f) $5x^6$

Problem 3 Very roughly speaking, what does the graph of $y = 5x^6 - 5x^5 - 5x^4 + 5x^3 + x^2 - 1$ look like?

How fast was the pen going?

Multiple Choice:

- (a) *The graph starts in the lower left and ends in the upper right of the plane.*
 - (b) *The graph starts in the lower right and ends in the upper left of the plane.*
 - (c) *The graph looks something like the letter “U.” ✓*
 - (d) *The graph looks something like an upside down letter “U.”*
-