Welcome to MAT135 LEC0501 (Assaf)

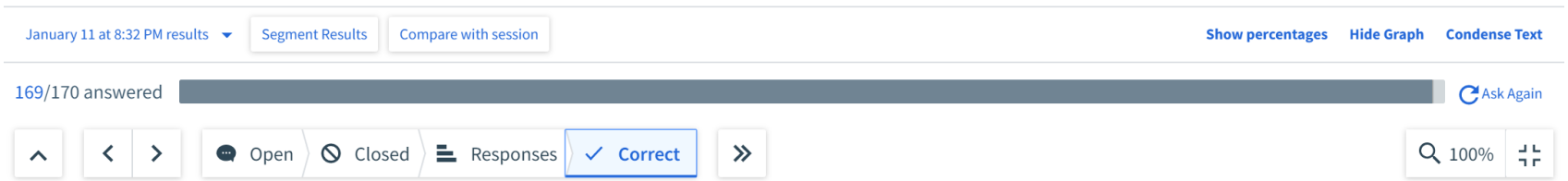
Share with your neighbour something you did during this rainy weekend.

Submissions Closed

Suppose that f is a continuous function. Then $\int_0^2 f(x)dx = \int_0^2 f(t)dt$

✓ **77%** Answered Correctly

A	True, and I am confident in my answer.	85
B	True, and I am not confident in my answer.	45
C	False, and I am not confident in my answer.	17
D	False, and I am confident in my answer.	22



S5.4 – Properties, Theorems, and Bounds on Definite Integrals

Assaf Bar-Natan

" On a tour of one-night stands my suitcase and guitar in hand
And every stop is neatly planned for a poet and a one-man band...
Homeward bound "

–" Homeward Bound ", Simon & Garfunkel

Jan. 13, 2020

Takeaway

In expressions like $\int_a^b f(x)dx$, the variable x is a dummy variable – It only is there to remind us that f is a function and that we are integrating with respect to its input.

Integration Theorems Round Robin

Get into groups of 3-4.

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- Go around your group, and one by one state an integration theorem.

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- Go around your group, and one by one state an integration theorem.
- Go through the textbook, and make sure all of the theorems from chapter 5.4 have been stated.

Draw a Theorem

Below is a summary of some of the theorems from chapter 5.4:

$$\int_a^b (f(x)+g(x))dx = \int_a^b f(x)dx + \int_a^b f(x)dx$$

$$\int_a^b cf(x)dx = c\int_a^b f(x)dx$$

$$\int_a^b f(x)dx + \int_b^c f(x)dx = \int_a^c f(x)dx$$

And some of the bounds:

$$m \le f(x) \le M \Rightarrow m(b-a) \le \int_a^b f(x)dx \le M(b-a)$$

$$f(x) \le g(x) \Rightarrow \int_a^b f(x)dx \le \int_a^b g(x)dx$$

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In your group, choose one of these theorems and one of these bounds, and draw a picture explaining why it's true.

Submissions Closed

If $\int_a^b f(x)\,dx \le \int_a^b g(x)\,dx$ then on the interval [a,b], $f(x) \le g(x)$

✓ **63%** Answered Correctly

A	True, and I can explain why	50
B	True, and I'm not sure why	29
C	False and I'm not sure why	24
D	False, and I have a counter-example	108

January 11 at 8:34 PM results | Segment Results | Compare with session | Show percentages | Hide Graph | Condense Text

211/211 answered | Ask Again

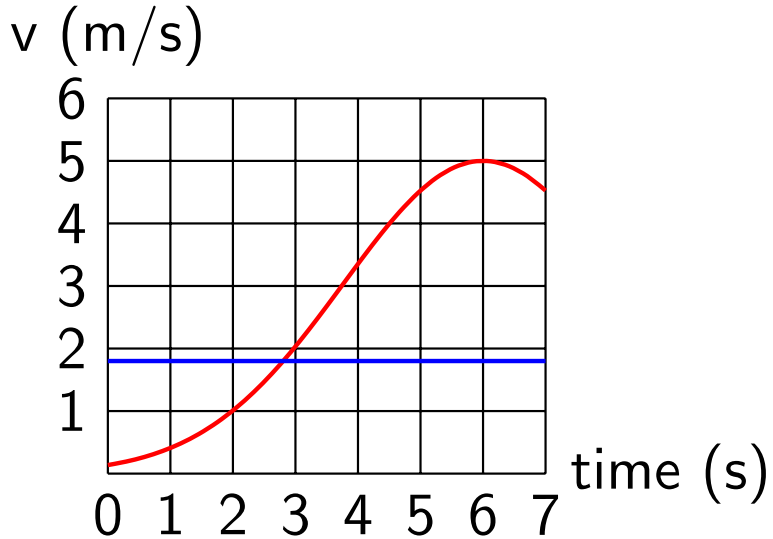
Open | Closed | Responses | Correct | 100%

Takeaway

If we know that $f(x) \leq g(x)$ on $[a, b]$, then $\int_a^b f(x)dx \leq \int_a^b g(x)dx$. However, we cannot reverse this!

An Application

Marzipan is chasing a mouse along the side of the barn. The mouse has a head start of about $1m$, and the velocities of Marzipan (red) and the mouse (blue) are plotted below:



Will Marzipan catch the mouse?

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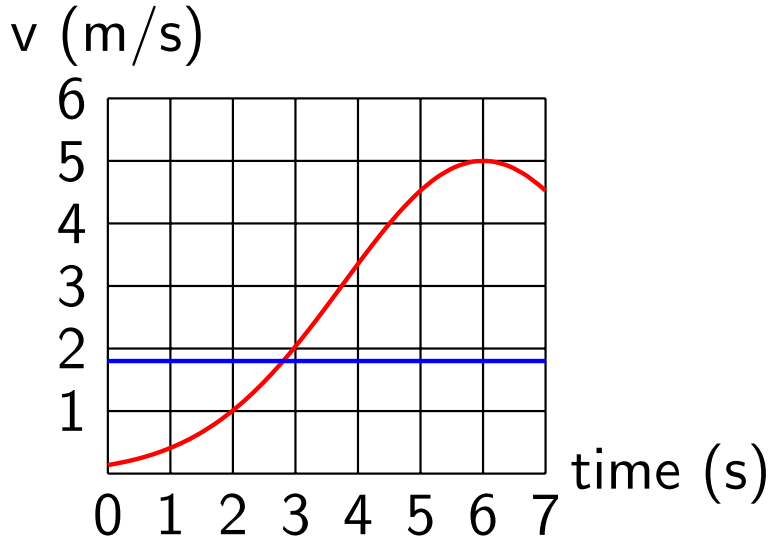
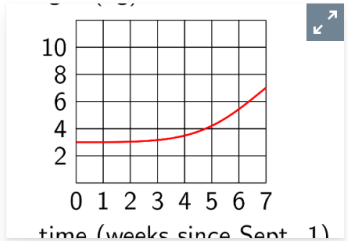


Will Marzipan catch the mouse? When?

Submissions Closed

Obie the cat is bulking up for the cold winter. His weight, w(t) is given by the red line in the graph. Which of the following statements are incorrect (select ALL incorrect statements)?



✓ **12%** Answered Correctly

A	Obie's average weight in the last two weeks is more than his average weight over the entire seven weeks	57
B	Obie's average weight over the seven weeks is an increasing function	48
C	Obie's average weight over the seven weeks is equal to $w(7) - w(0)$	159
D	Obie's average weight over the seven weeks is somewhere between 8 and 3	54

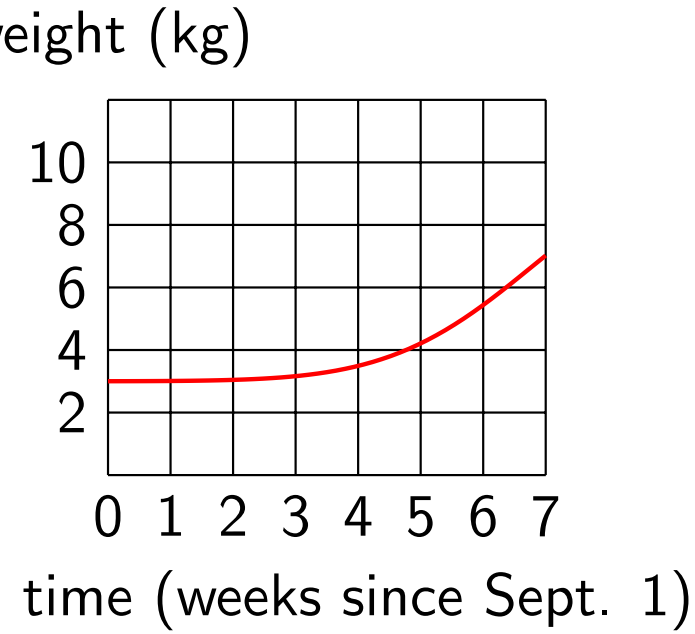
January 11 at 8:48 PM results | Segment Results | Compare with session | Show percentages | Hide Graph | Condense Text

186/187 answered | Ask Again

Open | Closed | Responses | Correct | 88%

Using Integrals to Estimate Averages

Obie's weight over the fall season is plotted below:



Estimate Obie's average weight during this time.

Plans for the Future

For next time:

WeBWork 6.1 and read section 6.1