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Math 252 Homework 13 Written Part **Name:** KEY

Write legibly. Show your work. Graph neatly. Use a ruler for all straight lines.

Average Value of a Function:

Given $f(x)=(x-3)^2+1$, find the average value of the function on the interval [2,5]. Make sure you clearly show how you set up your integral, then show how you integrate.

$$\text{AvgVal} = \frac{1}{b-a}\int_a^b f(x)\,dx$$

$$\text{Avg Value} = \frac{1}{5-2}\int_2^5 (x-3)^2+1\,dx$$ ✓

don't mult out

$$= \frac{1}{3}\left[\frac{(x-3)^3}{3}+x\right]_2^5$$

$$= \frac{1}{3}\left[\frac{8}{3}+5\right]-\frac{1}{3}\left[\frac{-1}{3}+2\right]$$

$$= \frac{1}{3}\left[\frac{8}{3}+\frac{1}{3}+5-2\right]$$

$$= \frac{1}{3}\left[\frac{9}{3}+3\right]$$

$$= \frac{1}{3}[6]$$

$$= 2$$

do mult out

$$= \frac{1}{3}\int_2^5 x^2-6x+10\,dx$$

$$= \frac{1}{3}\left[\frac{1}{3}x^3-3x^2+10x\right]_2^5$$

$$= \frac{1}{3}\left[\frac{125}{3}-75+50\right]-\frac{1}{3}\left[\frac{8}{3}-12+20\right]$$

$$= \frac{1}{3}\left[\frac{125}{3}-25-\frac{8}{3}-8\right]$$

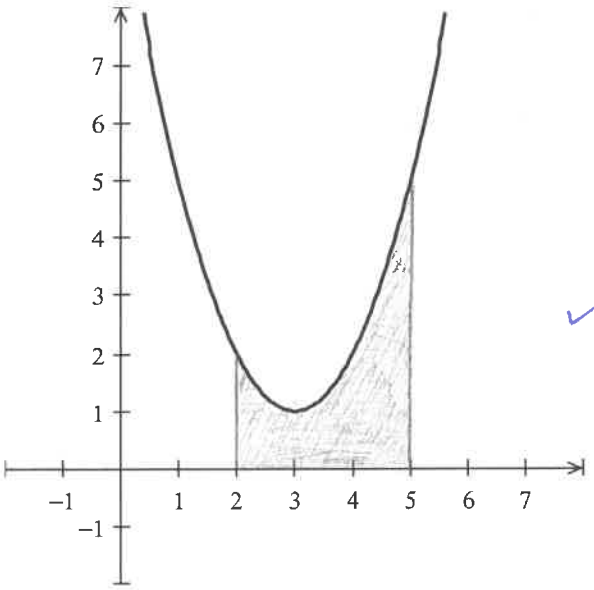
$$= \frac{1}{3}\left[\frac{117}{3}-33\right]$$

$$= \frac{1}{3}[39-33]$$

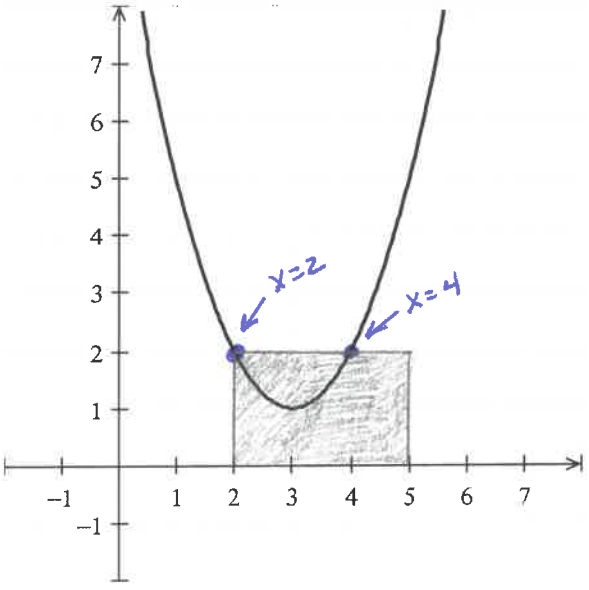
$$= \frac{1}{3}[6]$$

$$= 2$$ ✓

On this copy of the graph, shade in the area under the curve on the interval [2,5].



On this copy of the graph, shade in a rectangle on the interval [2,5] whose area is the same as the area under the curve.



Now, find all x-values for which the value of the function equals the average value of the function. Show your work clearly, and double check that your answer(s) match what you drew in the second graph above.

$f(x) = f_{avg}(x)$

$(x-3)^2 \pm 1 = 2$

$-1 \quad -1$

show work?

$\sqrt{(x-3)^2} = \pm\sqrt{1}$

$x - 3 = \pm 1$

$+3 \quad +3$

$x = -1+3,\ 1+3$

$x = 2, 4$

see right hand graph above!