Just In Time Quick Check

[**Standard of Learning (SOL) AII.7b**](https://www.doe.virginia.gov/home/showpublisheddocument/3068/637982465258630000)

| Strand: Functions |
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| Standard of Learning (SOL) AII.7b***The student will investigate and analyze linear, quadratic, absolute value, square root, cube root, rational, polynomial, exponential, and logarithmic function families algebraically and graphically. Key concepts include intervals in which a function is increasing or decreasing.***  |
| Grade Level Skills: * Given the graph of a function, identify intervals on which the function (linear, quadratic, absolute value, square root, cube root, polynomial, exponential, and logarithmic) is increasing or decreasing.
* Investigate and analyze characteristics and multiple representations of functions with a graphing utility.
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| [Just in Time Quick Check](#quick) |
| [Just in Time Quick Check Teacher Notes](#teacher) |
| Supporting Resources: * VDOE Mathematics Instructional Plans (MIPS)
	+ AII.7ah -Functions: Domain, Range, Continuity and End Behavior ([Word](https://www.doe.virginia.gov/home/showpublisheddocument/16032/638035859821700000)) / [PDF Version](https://www.doe.virginia.gov/home/showpublisheddocument/16034/638035859828870000)
* VDOE Word Wall Cards: Algebra II ([Word](https://www.doe.virginia.gov/home/showpublisheddocument/18630/638041054191430000)) | ([PDF](https://www.doe.virginia.gov/home/showpublisheddocument/18632/638041054205170000))
	+ Increasing/Decreasing
* VDOE Rich Mathematical Tasks: Algebra II
	+ AII.6 Function of a Ride Task Template ([Word](https://www.doe.virginia.gov/home/showpublisheddocument/26436/638045684514400000)) / ([PDF)](https://www.doe.virginia.gov/home/showpublisheddocument/26466/638045684589030000)
* Desmos Activity
	+ [Polygraph: Polynomial Functions](https://teacher.desmos.com/polygraph/custom/560c53f3441172070b2621f9)
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| Supporting and Prerequisite SOL: [AII.6a](https://www.doe.virginia.gov/home/showpublisheddocument/25500/638045622263570000), [AII.7a](https://www.doe.virginia.gov/home/showpublisheddocument/25506/638045622282770000), [A.6a](https://www.doe.virginia.gov/home/showpublisheddocument/25500/638045622263570000), [8.16a](https://www.doe.virginia.gov/home/showpublisheddocument/25320/638045435980470000) |

SOL AII.7b - Just in Time Quick Check

1. Sketch the graph of a function $g\left(x\right)$ that is:
* decreasing throughout the interval $(-\infty ,2)$
* increasing throughout the interval $(2,3)$
* decreasing throughout the interval $(3,\infty )$.



1. The function $f\left(x\right)=-\frac{1}{4}x^{4}+2x^{3}$ is shown.



Write the intervals where the graph is:

* only decreasing
* only increasing.

| Decreasing Interval | Increasing Interval |
| --- | --- |
|  |  |

1. Identify the intervals on which the function $f\left(x\right)=\left(x-1\right)(x+2)^{2} $ appears to be always increasing. Select all correct intervals.

| $$4<x<8$$ | $$-2<x<0$$ | $$-\infty <x<-2$$ | $$-\infty <x<\infty $$ |
| --- | --- | --- | --- |

SOL AII.7b - Just in Time Quick Check Teacher Notes

**Common Errors/Misconceptions and their Possible Indications**

1. Sketch the graph of a function $g\left(x\right)$ that is:
* decreasing throughout the interval $(-\infty ,2)$
* increasing throughout the interval $(2,3)$
* decreasing throughout the interval $(3,\infty )$.



*A common error some students may make is to have the graph turning at points (x, 2) and (x, 3). This may indicate a misunderstanding in using the y-values to name intervals when describing whether a function is increasing or decreasing. A strategy that may benefit some students is to draw vertical lines through the turning points intersecting the x-axis to indicate parts of the domain that are used in naming the intervals in which the graph is increasing/decreasing. Desmos would be beneficial to use for illustrating the given function and drawing vertical lines at turning point locations to emphasize that the domain values are associated with increasing/decreasing intervals.*

1. The function $f\left(x\right)=-\frac{1}{4}x^{4}+2x^{3}$ is shown.



Write the intervals where the graph is:

* only decreasing
* only increasing.

| Decreasing Interval | Increasing Interval |
| --- | --- |
|  |  |

*A common error some students might make is to state an increasing interval of* $-\infty <x<3$*. This may indicate a misunderstanding that (0, 0) is included in the interval however, f(x) is not consistently increasing over the entire interval from* $-\infty <x<3$ *. A possible teaching strategy would be to remind students to read graphs from left to right when describing increasing/decreasing intervals. Using a highlighter to indicate where the graph is rising (consistently increasing) may help some students. In addition, the students could examine what is happening to the y-values as the x values are increasing. Use the Desmos slider feature to visually show students the results as the x-values increase, what is happening to the corresponding y-values. Ask students questions like - At what value does the function begin to decrease? At what value(s) does the function not consistently increase or consistently decrease?*

1. The function$ f\left(x\right)=\left(x-1\right)(x+2)^{2} $ is increasing throughout which intervals, select all that apply -

| $$4<x<8$$ | $$-2<x<0$$ | $$-\infty <x<-2$$ | $$-\infty <x<\infty $$ |
| --- | --- | --- | --- |

*A common error some students might make is not selecting* $4<x<8$ *as an increasing interval. This misconception may happen because some students only recognize intervals that connect turning points. A possible teaching strategy is to show students that the y-value is increasing at each x-value from 4 to 8 by using an input/output table.*