

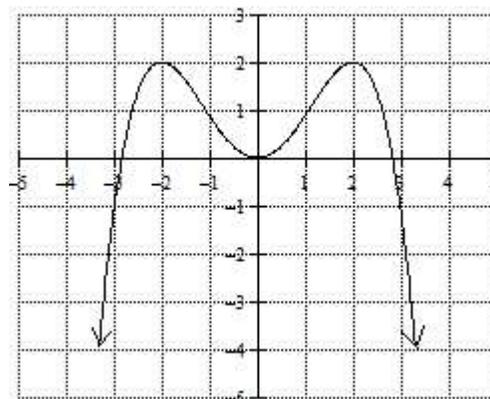
Day #16 Homework

1. If $g'(x) = (x - 3)^2(x + 1)$, determine on what intervals the graph of $g(x)$ is increasing or decreasing and identify the value(s) of x at which $g(x)$ has a relative maximum or minimum. Justify your reasoning and show your work.

For exercises 2 – 4, use the graph of t function, $h(x)$, pictured to the right. Use the graph to identify the following. **Provide written justification.**

2. On what interval(s) is $h'(x) < 0$?

3. On what interval(s) is $h'(x) > 0$?

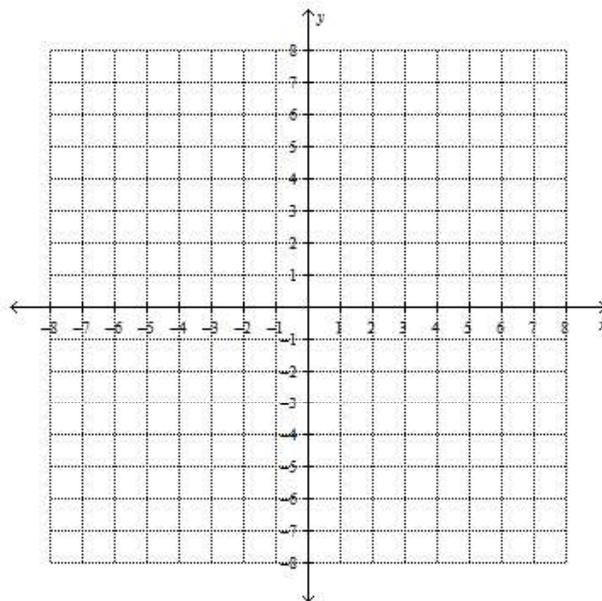


4. At what value(s) of x does $h'(x)$ change from positive to negative? From negative to positive?

Consider the quadratic function $f(x) = -\frac{1}{2}x^2 - x + 4$.

5. Sketch an accurate graph of the function.

6. Find $f'(x)$ and use it to find the absolute maximum of the graph of $f(x)$.



7. Estimate the value of $f'(0)$ and explain what this value represents in terms of the graph of $f(x)$.

8. Find the equation of the tangent line to the graph of $f(x)$ at $x = 0$. Draw a graph of this line.

9. Sketch a graph of the normal line to the tangent line at $x = 0$. What is the equation of this line?

10. Use the equation of the tangent line to approximate $f(0.1)$. Then, find $f(0.1)$ using the equation of $f(x)$. Is the approximation an under or over approximation of the actual value of $f(0.1)$? Based on the graph of $f(x)$, why do you suppose this is true?

11. For what function does $\lim_{h \rightarrow 0} \frac{2 \sin(x+h) - 2 \sin x}{h}$ give the derivative? Find the limit.

12. Find $\lim_{h \rightarrow 0} \frac{(x+h)^5 - x^5}{h}$.

13. Find $\lim_{h \rightarrow 0} \frac{\sqrt{x} - \sqrt{x+h}}{h}$.

14. If $f(x) = \frac{3x}{\sqrt{x}}$, what is the slope of the normal line to the graph of $f(x)$ when $x = 4$?

15. If $2x - 3 = 5(y + 1)$ is the equation of the normal line to the graph of $f(x)$ when $x = a$, find the value of $f'(a)$. Show your work and explain your reasoning.

16. On the interval $[0, 2\pi)$, find the coordinates of the relative minimum(s) of $f(\theta) = \sqrt{3}\theta - 2\sin\theta$.

The derivative of a function $f(x)$ is $f'(x) = (3-x)^2(x+5)$. Use this derivative for exercises 17 and 18.

17. At what value(s) of x does the graph of $f(x)$ have a relative maximum? Justify your answer.

18. Use the equation of the tangent line to approximate the value of $f(2.1)$ if $f(2) = -3$.