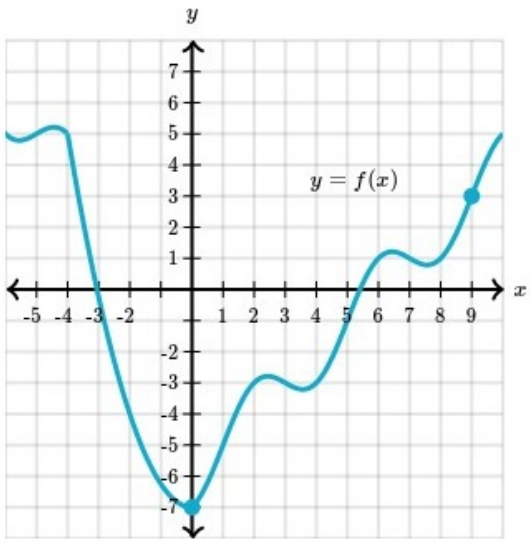
Directions:

- Do only the Checkpoint problems that you need to take and feel ready to take. If you have already earned Mastery on a Learning Target, do not attempt a problem for that Target! You can skip a Target if you need more time to practice with it, and take it on the next round.
- **Do not attempt any problem for a Learning Target for which you've earned a Mastery rating**.
- Do not put any work on this form; do all your work on separate pages. You may either handwrite or type up your work.
- Clearly indicate which Learning Target you are attempting at the beginning of its solution; please also turn in solutions for learning targets in order (for example, do not turn in work for F.2 after work for D.1). The easiest way to do this is to put each Learning Target on its own solution page and do not put more than one Learning Target on a single page.
- If you are handwriting, submit your work by **scanning your work** using a scanning app or scanning device; **do not just take a picture** but scan your work to a clear, legible, black and white PDF file of size less than 100 MB. Work submitted as an image file (JPG, PNG, etc.) will not be graded.
- Unless explicitly stated otherwise, you must show your work or explain your reasoning clearly on each item of each problem you do. Responses that consist of only answers with no work shown, or where the work is insufficient or difficult to read, or which have significant gaps or omissions (including parts left blank) will be given a grade of "x".
- Submit your work by uploading it as a PDF or Word file to the appropriate assignment area on Blackboard.
- **Reminder**: Learning Target F.1 is *not* assessed using Checkpoints; you earn Proficiency and Mastery on that Target using the **Functions Bootcamp** assignment.

Learning Target F.2: *I can find the average rate of change of a function on an interval.*

1. Let $f(x) = 2^x$. Find the average rate of change in f on the intervals $[1, 2]$ and $[4, 4.01]$.
2. Let $g(x)$ be the graph shown below. Find the average rate of change in g on the intervals $[-4, 4]$ and $[0, 9]$.

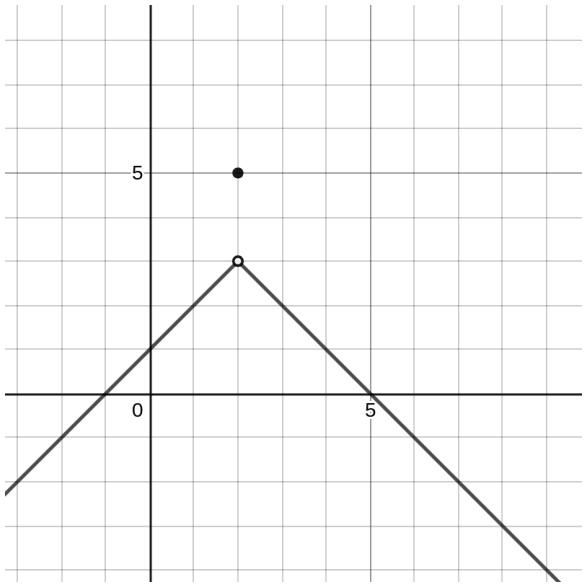


Learning Target L.1 (Core): *I can find the limit of a function at a point using numerical, graphical, and algebraic methods.*

1. Complete the table of values below using the function $f(x) = \dfrac{x^2 - 7x + 10}{x - 5}$. Then state the value of $\lim_{x \to 5} f(x)$ and explain your reasoning.

x	4.5	4.9	4.99	5.01	5.1	5.5
$f(x)$						

2. Using only algebra (no graphs or tables), evaluate $\lim\limits_{x \to 2} \dfrac{x^2 - 3x + 2}{x^2 - 2x}$.
3. The function $h(x)$ is shown below. State the value of $\lim\limits_{x \to -1} h(x)$ and explain your reasoning.



Learning Target D.1 (Core): *I can find the derivative of a function, both at a point and as a function, using the definition of the derivative.*

Consider the function $f(x) = 3x^2 - 2x - 4$.

1. Set up, but do not evaluate, the limit that would compute $f'(2)$ (the derivative of f at the point $x = 2$).
2. Set up, but do not evaluate, the limit that would compute $f'(x)$ (the formula for the derivative of f at any point).
3. Choose one of the limits you set up and evaluate it to find either $f'(2)$ or $f'(x)$.

Learning Target D.2 (Core): *I can use derivative notation correctly, state the units of a derivative, estimate the value of a derivative using difference quotients, and correctly interpret the meaning of a derivative in context.*

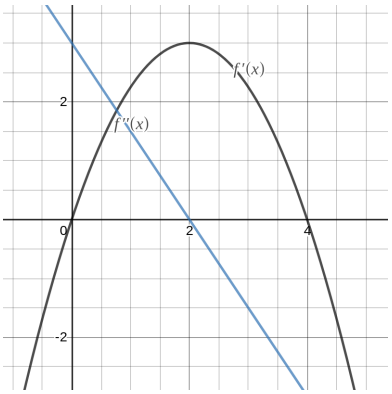
Fred drove from Lansing to Detroit. The function D gives the total distance that Fred has driven (in kilometers) t hours after he left.

1. Suppose $D'(5) = 100$. State the units of measurement for the numbers 2 and 100. (Clearly indicate which is which.)
2. Suppose $D(3) = 80$, $D(5) = 65$, and $D(7) = 70$. Use forward, backward, and central differences to estimate $D'(5)$. Clearly indicate which estimate is which.

3. Suppose $D'(3) = 85$. Explain the meaning of this statement in ordinary terms (that is, in terms of distance and time) and without using any technical jargon, including the terms "function", "derivative", "rate of change", "graph", "tangent", or "slope".

Learning Target D.3 (Core): *Given information about f, f', or f'', I can correctly give information about f, f', or f'' and the increasing/decreasing behavior and concavity of f (and vice versa).*

Below are the graphs for the first and second derivatives of a function f. The first derivative graph is the curve; the second derivative graph is the straight line.



1. Is the original function f increasing at $x = 3$, or decreasing at $x = 3$? State your answer clearly and then give a clear and correct explanation. If it's impossible to decide based on the information you're given, say so and then explain why clearly.
2. Is the original function f concave up at $x = 3$, or concave down at $x = 3$? State your answer clearly and then give a clear and correct explanation. If it's impossible to decide based on the information you're given, say so and then explain why clearly.

Learning Target D.4: *I can find the equation of the tangent line to a function at a point and use the tangent line to estimate values of the function.*

Find each of the following. Make sure your answer is clearly indicated (for example by circling it). You are being graded on your processes as well as your answers, so show all your work.

1. Find an equation for the tangent line to the graph of $y = -6x^2 + 2$ at $x = 3$.
2. A function $f(x)$ is such that $f(1) = 5$ and $f'(1) = -2$. Find an equation for the tangent line to the graph of $f(x)$ at $x = 1$, and then use the line to estimate the value of $f(3)$.

Learning Target DC.1: *I can compute derivatives correctly for power, polynomial, and exponential functions and the sine and cosine functions, and basic combinations of these (constant multiples, sums, differences).*

Find the derivatives of each of the following functions. Make sure your answer is clearly indicated (for example by circling it). You are being graded on your processes as well as your answers, so show all your work.

1. $f(x) = 4x^5 + 2x^{4/5} + 5^x - 5^2$
2. $g(x) = 4\sin(x) + 9\cos(x)$
3. $h(x) = \dfrac{x^2 + x + 1}{x}$ (Do NOT use the Quotient Rule.)
4. $j(x) = x^{1/5} + \sqrt{(}x)$