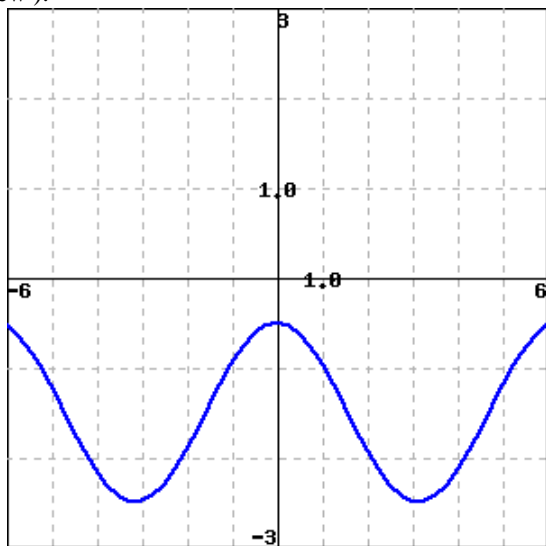


Principles of Calculus Modeling: An Interactive Approach by Donald Kreider, Dwight Lahr, and Susan Diesel
Exercises for Section 2.7

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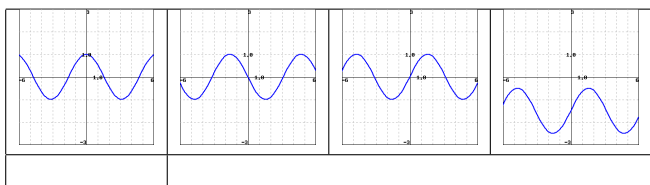
1. (1 pt)

Below is the graph of a function g (Click image for a larger view).



Which of the following graphs corresponds to the derivative of g ?

—



Is g differentiable everywhere on the domain shown? Enter **yes** or **no**.

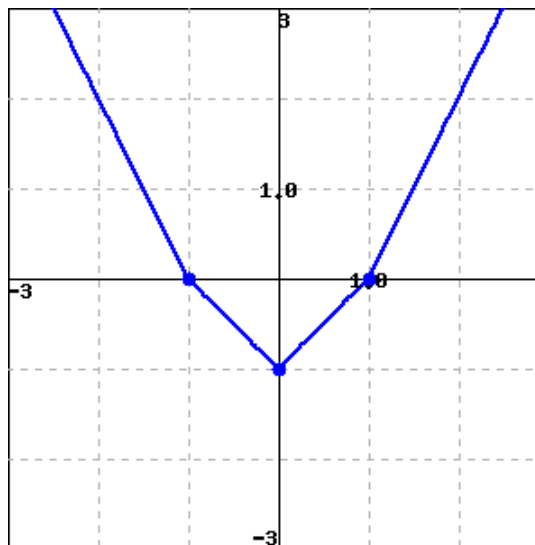
—

Enter below any points at which g is **not** differentiable in increasing order of x , e.g. enter -5 before -1, and -1 before 3. Leave any unused answer boxes blank.

$x =$ _____
 $x =$ _____
 $x =$ _____

2. (1 pt)

Below is the graph of a function f (Click image for a larger view).



Sketch the graph of the derivative of f . Where is f differentiable?

Enter below any points at which f is **not** differentiable in increasing order of x , e.g. enter -5 before -1, and -1 before 3. Leave any unused answer boxes blank.

$x =$ _____
 $x =$ _____
 $x =$ _____

3. (1 pt)

Use the definition of derivative,

$$f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$$

to calculate the derivative of the following function:

$$f(x) = \frac{1-x}{1+x}$$

Enter the following answers as functions in terms of x and h . (Of course, $f'(x)$ should be just in terms of x .)

What is $f(x+h)$?

What is $\frac{f(x+h) - f(x)}{h}$, reduced as far as possible?

Numerator = _____

Denominator = _____

What is $f'(x)$?

4. (1 pt)

How should the function $f(x) = x \operatorname{sgn} x$ be defined at $x = 0$ so that it is continuous there? Recall that $\operatorname{sgn} x = \frac{x}{|x|}$; that is, $\operatorname{sgn} x$ takes the value 1 if $x > 0$, -1 if $x < 0$, and is undefined if $x = 0$.

$f(0) =$ _____

Is it then differentiable there? (yes/no)

—

5. (1 pt)

Using the General Power Rule, calculate the derivative of $f(x) = x^{-21}$.

$f'(x) =$ _____

Where is the derivative valid? Enter any x values for which the derivative is **not** valid in increasing order of x . Leave any unused boxes blank.

6. (1 pt)

Calculate the derivative of the following function using the General Power Rule.

$y = x^{-7/2}$

$y' =$ _____

For which values of x is the derivative valid?

- A. All real numbers satisfying $x > 0$.
- B. All real numbers.
- C. All real numbers except $x = 0$.
- D. All real numbers satisfying $x \geq 0$.
- E. None of these.

7. (1 pt)

Calculate $\frac{d}{ds} s^{(1/4)} \Big|_{s=4}$.

8. (1 pt)

Find $F'(\frac{1}{4})$ if $F(x) = x^{-4}$.

$F'(\frac{1}{4}) =$ _____

9. (1 pt)

Let $y = x^{-7.5}$. Calculate the value of y' at the point $(4, 4^{-7.5})$.

$y' =$ _____

10. (1 pt)

For the function $g(x) = x^{-a}$, what is $\frac{d}{dx} g(x)$?

$\frac{d}{dx} g(x) =$ _____

11. (1 pt)

What is the derivative of the function $f(x) = x^{5005}$?

12. (1 pt)

Let $f(x) = x^3$, $g(x) = x^2$, and $h(x) = x$.

What is the derivative of $f(x)$ evaluated at $x = 1$?

What is the derivative of $g(x)$ evaluated at $x = 1$?

What is the derivative of $h(x)$ evaluated at $x = 1$?

What do you think the derivative of $f(x) + g(x) + h(x)$ is at $x = 1$?

13. (1 pt)

Let $f(x) = x^\pi$. What is the derivative of $f(x)$?

14. (1 pt)

Use the definition of the derivative to find $f'(x)$ where $f(x) = \sqrt{4x+4}$.

$f'(x) =$ _____

15. (1 pt)

What is the derivative of $(x^4)^6$ at $x = 4$?
