Clicker Questions

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Review of Limits

If a function $y = f(x)$ is not defined at $x = a$, then

a) $\lim_{x\to a} f(x)$ cannot exist.
b) $\lim_{x\to a} f(x)$ could be zero.
c) $\lim_{x\to a} f(x)$ must approach ∞
d) None of the above are true.

Derivative and LImits

Recall that we defined the *instantaneous velocity* as the limit of the average rate of change of position.

Can the average rate of change on an interval $[1, 2]$ equal the instantaneous velocity at $t = 1$?

a) Yes

b) No

Order derivative values

For the function $g(x)$ shown below, arrange the following numbers in increasing order.

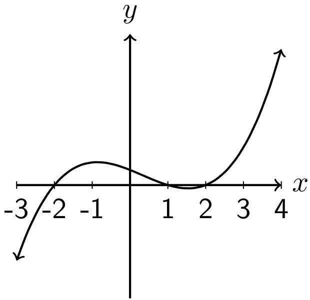
a) 0

b) $g'(-2)$

c) $g'(0)$

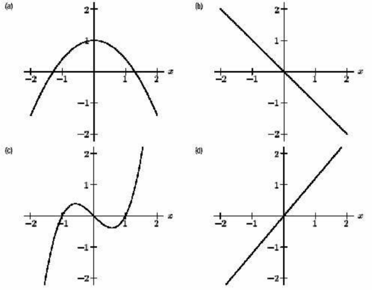
d) $g'(1)$

e) $g'(3)$



Derivative Function I

1. Which of the following graphs is the graph of the derivative of the function shown in Figure 2.6?



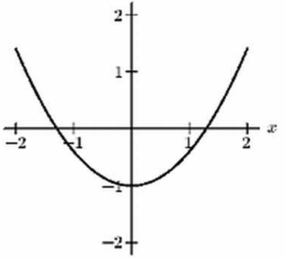


Figure 2.6

2. Which of the following graphs is the graph of the derivative of the function shown in Figure 2.8?

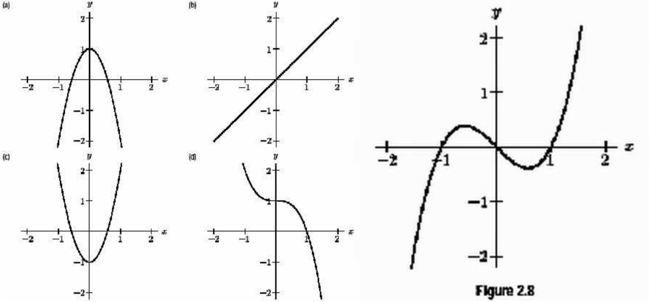


Figure 2.8

13. If $f(x) = x^2 + \frac{3}{x}$, then what is $f'(x)$?

(a) $2x - 3x^{-2}$

(b) $2x + 3x^{-1}$

(c) $2x - 3x^2$

(d) $x^2 - 3x^{-1}$

Derivative Rules II

If $f(x) = \pi^2$, then what is $f'(x)$?

(a) 2π

(b) π^2

(c) 0

(d) 2

Derivative Rules III

The derivative of the function $f(x) = e^{x+2}$ is

a) $(x+2)e^{x+1}$
b) $e^2 e^x$
c) e^2
d) 0
e) Cannot be determined from what we know

The 10th derivative of $\sin x$ is

(a) $\sin x$

(b) $\cos x$

(c) $-\sin x$

(d) $-\cos x$

Product Rule I

1. $\frac{d}{dx}\left(x^2 e^x\right) =$
   (a) $2xe^x$
   (b) $x^2 e^x$
   (c) $2xe^x + x^2 e^{x-1}$
   (d) $2xe^x + x^2 e^x$

Product Rule II

5. When differentiating a constant multiple of a function (like $3x^2$) the Constant Multiple Rule tells us $\frac{d}{dx}cf(x) = c\frac{d}{dx}f(x)$ and the Product Rule says $\frac{d}{dx}cf(x) = c\frac{d}{dx}f(x) + f(x)\frac{d}{dx}c$. Do these two rules agree?

   (a) Yes, they agree, and I am very confident.

   (b) Yes, they agree, but I am not very confident.

   (c) No, they do not agree, but I am not very confident.

   (d) No, they do not agree, and I am very confident.

Quotient Rule I

11. $\frac{d}{dt}\frac{\sqrt{t}}{t^2+1} =$

(a) $\dfrac{\frac{1}{2}t^{-1/2} - 2t}{(t^2+1)^2}$

(b) $\dfrac{\frac{1}{2}t^{-1/2}t^2 - 2t\sqrt{t}}{(t^2+1)^2}$

(c) $\dfrac{\frac{1}{2}t^{-1/2}(t^2+1) - 2t\sqrt{t}}{(t^2+1)^2}$

(d) $\dfrac{t^{-1/2}(t^2+1) - 2t\sqrt{t}}{(t^2+1)^2}$

Product Rule III

12. If $f(3) = 2$, $f'(3) = 4$, $g(3) = 1$, $g'(3) = 3$, and $h(x) = f(x)g(x)$, then what is $h'(3)$?

(a) 2

(b) 10

(c) 11

(d) 12

(e) 14

14. If $h = \frac{ab^2 e^b}{c^3}$ then what is $\frac{dh}{db}$?

(a) $\frac{2abe^b}{c^3}$

(b) $\frac{2abe^b}{3c^2}$

(c) $\frac{2abe^b + ab^2 e^b}{c^3}$

(d) $\frac{2abe^b c^3 - 3c^2 ab^2 e^b}{c^6}$

3. $\frac{d}{dx}\sqrt{1-x} =$

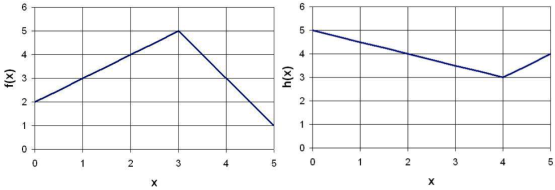
(a) $\frac{1}{2}(1-x)^{-1/2}$

(b) $-\frac{1}{2}(1-x)^{-1/2}$

(c) $-(1-x)^{-1/2}$

(d) $-\frac{1}{2}(1-x)^{1/2}$

12. The functions $f(x)$ and $h(x)$ are plotted below. The function $g(x) = f(h(x))$. What is $g'(2)$?



(a) $g'(2) = -\frac{1}{2}$

(b) $g'(2) = 1$

(c) $g'(2) = 3$

(d) $g'(2) = 4$

(e) $g'(2)$ is undefined

Inverse Functions I

The derivative of the function $f(z) = \ln(z^2+1)$ is

a) $2z\ln(z^2+1)$

b) $\dfrac{2z}{z^2+1}$

c) $\dfrac{-1}{z^2+1}$

d) None of the above

10. If $q = a^2 \ln(a^3 c \sin b + b^2 c)$, then $\frac{dq}{db}$ is

(a) $\frac{a^2}{a^3 c \sin b + b^2 c}$

(b) $\frac{a^5 c \cos b + 2a^2 bc}{a^3 c \sin b + b^2 c}$

(c) $\frac{a^3 c \cos b + 2bc}{a^3 c \sin b + b^2 c}$

(d) $\frac{6a^3 \cos b + 4ab}{a^3 c \sin b + b^2 c}$

The derivative of the implicit function $x^3 + y^3 - 9xy = 0$ is

a) $\dfrac{dy}{dx} = \dfrac{-3x^2 - y}{y^2 - 3x}$

b) $\dfrac{dy}{dx} = \dfrac{x^2}{y^2 + 3x}$

c) $\dfrac{dy}{dx} = \dfrac{3y - x^2}{y^2 - 3x}$

d) $\dfrac{dy}{dx} = -\dfrac{x^2 + y}{y^2 + 3x}$

e) None of the above

6. You wish to approximate $\sqrt{9.3}$. You know the equation of the line tangent to the graph of $f(x) = \sqrt{x}$ where $x = 9$. What value do you put into the tangent line equation to approximate $\sqrt{9.3}$?

   (a) $\sqrt{9.3}$

   (b) 9

   (c) 9.3

   (d) 0.3

Local Linearization II

Suppose that $f''(x) < 0$ for x near a. Then the local linearization $L(x)$ for $y = f(x)$ at $x = a$ is

a) more than the true value (an over-estimate)

b) less than the true value (an under-estimate)

c) we cannot tell from the given information