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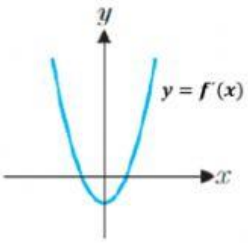
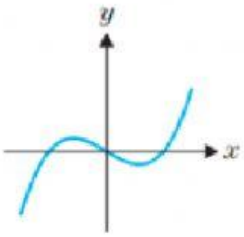
1)) : Sketch the graph of a function using that of its derivative

Use the graph of $y = f'(x)$ to sketch a graph of $y = f(x)$.

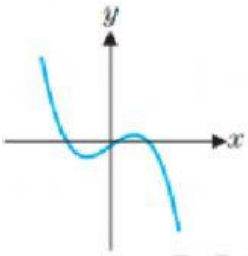
استخدم التمثيل البياني لـ $y = f'(x)$ لرسم التمثيل البياني $y = f(x)$.



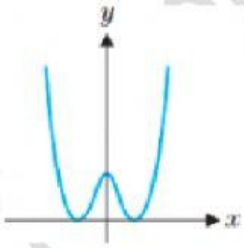
A)



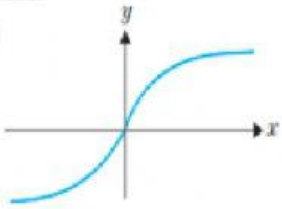
B)



C)



D)



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2))

Find limits for polynomials, rational, and trigonometric functions using theorems

Evaluate $\lim_{x\to 0} \frac{2x}{3-\sqrt{x+9}}$.

أوجد قيمة $\lim_{x\to 0} \frac{2x}{3-\sqrt{x+9}}$.

A) -12

B) -6

C) $-\frac{1}{6}$

D) $-\frac{1}{12}$

3))

Solve real-life problems using derivatives of exponential and logarithmic functions

The value of an investment at time t is given by $v(t) = 60e^{-0.2t}$. Find the instantaneous percentage rate of change.

قيمة الاستثمار في الزمن t تُحدد باستخدام $v(t) = 60e^{-0.2t}$.
أوجد النسبة المئوية للمعدل اللحظي للتغيّر.

A) -60%

B) -20%

C) 20%

D) 60%

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4))

Find derivatives of inverse trigonometric functions

Find the derivative of
$f(x) = \cos^{-1}(2x^3).$

أوجد مشتقة $f(x) = \cos^{-1}(2x^3)$.

A) $f'(x) = \frac{-6x}{\sqrt{1-9x^4}}$

B) $f'(x) = \frac{6x}{\sqrt{1-9x^4}}$

C) $f'(x) = \frac{-6x^2}{\sqrt{1-4x^6}}$

D) $f'(x) = \frac{6x^2}{\sqrt{1-4x^6}}$

5))

Checking one-sided limits

Evaluate $\lim_{x\to -1^+} \frac{|x+1|}{x^2-1}$.

أوجد قيمة $\lim_{x\to -1^+} \frac{|x+1|}{x^2-1}$.

A) -1

B) $-\frac{1}{2}$

C) $\frac{1}{2}$

D) 1

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6))

Apply the chain rule for differentiation

Given that the function $h(x) = f(g(x))$, use relevant information $f(1) = 3, f'(1) = 4, f'(2) = 3, g(1) = 2, g'(1) = -2, g'(3) = 5,$ to compute $h'(1)$.

على فرض أن الدالة $h(x) = f(g(x))$، استخدم المعلومات ذات الصلة $f(1) = 3, f'(1) = 4, f'(2) = 3, g(1) = 2, g'(1) = -2, g'(3) = 5,$ لحساب $h'(1)$.

A) $h'(1) = 3$

B) $h'(1) = 5$

C) $h'(1) = -6$

D) $h'(1) = 20$

7))

Find the derivatives of natural logarithmic functions

Use logarithmic differentiation to find the derivative of $f(x) = (x^2)^{4x}$.

استخدم تفاضل اللوغاريتم لإيجاد مشتقة الدالة $f(x) = (x^2)^{4x}$.

A) $f'(x) = (x^2)^{4x}(8 \ln x + 8)$

B) $f'(x) = (x^2)^{2x}(4 \ln x + 4)$

C) $f'(x) = 4(x^2)^{3x}(8 \ln x + 8)$

D) $f'(x) = 2(x^2)^{x}(4 \ln x + 4)$

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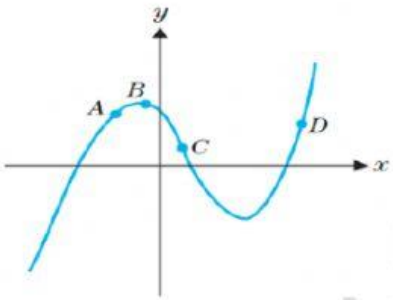
8)) Link and interpret the slopes of a secant line and tangent line

List the points A, B, C and D in order of increasing slope of the tangent line.

نظّم لائحة النقاط A و B و C و D بترتيب الميل المتزايد للمماس على المنحنى.



A) A, B, C, D

B) C, B, A, D

C) B, C, D, A

D) D, C, B, A

9)) Use differentiation rules and higher derivatives in solving real-life problems

The function $h(t) = 10t^2 - 24t$ represents the height of an object. Compute the velocity and acceleration at time $t = 1$.

تمثل الدالة $h(t) = 10t^2 - 24t$ ارتفاع جسم ما. احسب السرعة المتجهة والتسارع عند الزمن $t = 1$.

A) $v(1) = -4\,, a(1) = -20$

B) $v(1) = 4\,, a(1) = -20$

C) $v(1) = -4\,, a(1) = 20$

D) $v(1) = 4\,, a(1) = 20$

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10))

Apply the Quotient Rules on derivatives

Find the derivative of the function $f(x) = \frac{6x}{\sqrt{x}+1}$.

أوجد مشتقة الدالة $f(x) = \frac{6x}{\sqrt{x}+1}$.

A) $f'(x) = \frac{3\sqrt{x}-6}{(\sqrt{x}+1)^2}$

B) $f'(x) = \frac{6\sqrt{x}+6}{(\sqrt{x}+1)^2}$

C) $f'(x) = \frac{3\sqrt{x}+6}{(\sqrt{x}+1)^2}$

D) $f'(x) = \frac{6-3\sqrt{x}}{(\sqrt{x}+1)^2}$

11))

Find horizontal, vertical, and slant asymptotes using limits

Determine all vertical and slant asymptotes of $f(x) = \frac{x^3}{4-x^2}$.

حدّد كل خطوط التقارب الرأسية والمائلة لـ $f(x) = \frac{x^3}{4-x^2}$.

A) $x = 4, y = -x$

B) $x = -2, x = 2, y = 4x$

C) $x = -2, x = 2, y = x$

D) $x = -2, x = 2, y = -x$

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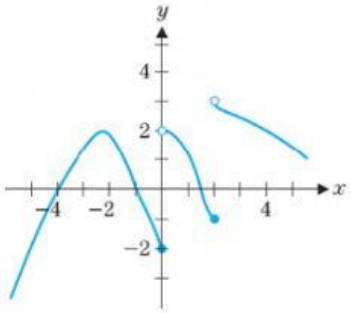
12)) Find the limit of a function algebraically and graphically if it exists

Use the graph to determine $\lim_{x\to 2^-} f(x)$. استخدم التمثيل البياني لتحديد $\lim_{x\to 2^-} f(x)$.



A) -1

B) -2

C) 2

D) 3

13)) Find the derivatives of trigonometric functions using differentiation rules

Find the derivative of the function $f(x) = \tan 3x - \csc^2 x$.

أوجد مشتقة الدالة $f(x) = \tan 3x - \csc^2 x$.

A) $f'(x) = 3\sec^2 3x + 2\csc^2 x \cot x$

B) $f'(x) = 3\sec^2 3x \tan 3x + 2\csc x \cot x$

C) $f'(x) = 3\sec^2 3x - 2\csc^2 x \cot x$

D) $f'(x) = 3\sec^2 3x \tan 3x - 2\csc x \cot x$

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14)) Find limits for polynomials, rational, and trigonometric functions using theorems

Evaluate $\lim_{x\to 0} \frac{1-e^{2x}}{1-e^{x}}$.

أوجد قيمة $\lim_{x\to 0} \frac{1-e^{2x}}{1-e^{x}}$.

A) -2

B) $-\frac{1}{2}$

C) $\frac{1}{2}$

D) 2

15)) Find limits for polynomials, rational, and trigonometric functions using theorems

Given that $\lim_{x\to 0^+} \frac{1-\cos x}{x^2} = \frac{1}{2}$,

إذا كانت النهاية $\lim_{x\to 0^+} \frac{1-\cos x}{x^2} = \frac{1}{2}$،

evaluate $\lim_{x\to 0^+} \frac{\sqrt{1-\cos x}}{x}$.

أوجد قيمة $\lim_{x\to 0^+} \frac{\sqrt{1-\cos x}}{x}$.

A) $\frac{\sqrt{2}}{2}$

B) $\sqrt{2}$

C) $\frac{1}{2}$

D) 2

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16)) Find derivatives implicitly

Find $y'(x)$ implicitly for $x^2y^2 + 3y = 4x$.

أوجد $y'(x)$ ضمنيًا لـ $x^2y^2 + 3y = 4x$.

A) $$y'(x) = \frac{4 - 2xy^2}{2x^2y + 3}$$

B) $$y'(x) = \frac{4 - 2xy}{x^2 + 3}$$

C) $$y'(x) = \frac{4 - 2xy^2}{2x^2y - 3}$$

D) $$y'(x) = \frac{4 - 2xy}{x^2 - 3}$$

17)) Use the continuity properties to study the continuity of a function

Determine the interval(s) where $f(x) = \sqrt{9 - x^2}$ is continuous.

حدّد الفترة (الفترات) التي تكون عندها $f(x) = \sqrt{9 - x^2}$ متصلة.

A) $(-3, 3)$

B) $[-3, 3]$

C) $(-\infty, -3] \cup [3, \infty)$

D) $(-\infty, -3) \cup (3, \infty)$