



Derivatives

- 1 On the interval $(-\infty, 2)$, is the concavity positive or negative?

$$f(x) = 2x^3 - 18x^2 + 48x$$

A Can't be determined

B Positive

C Negative

- 2 Find the derivative $f'(x)$.

$$f(x) = 7 \log_6(x)$$

A $f'(x) = \frac{7}{x}$

B $f'(x) = \frac{7}{x \ln(6)}$

C $f'(x) = \frac{7}{x \ln(x)}$

D $f'(x) = \frac{7 \ln(6)}{x}$

- 3 Find the derivative $f'(x)$ using the chain rule.

$$f(x) = (2x - 3)^4$$

A $f'(x) = 4(2x - 3)^3$

B $f'(x) = 8(2x - 3)^4$

C $f'(x) = 8(2x - 3)^3$

D $f'(x) = 2(2x - 3)^3$

- 4 Find the derivative $f'(x)$ using the chain rule.

$$f(x) = (3x - 6)^{-1}$$

A $f'(x) = -3(3x - 6)^{-2}$

B $f'(x) = -(3x - 6)^{-2}$

C $f'(x) = -3(3x - 6)^{-1}$

D $f'(x) = 3(3x - 6)^{-2}$

- 5 Find the derivative $f'(x)$ using the trigonometric rules and the chain rule.

$$f(x) = 4 \cos(3x^4 - 2x^2)$$

A $f'(x) = -4 \sin(3x^4 - 2x^2) \cdot (12x^3 - 4x)$

B $f'(x) = 4 \cos(3x^4 - 2x^2) \cdot (12x^3 - 4x)$

C $f'(x) = -4 \sin(3x^4 - 2x^2) \cdot (3x^4 - 2x^2)$

D $f'(x) = -4 \sin(3x^4 - 2x^2)$



Derivatives

- 6** Find the derivative $f'(x)$ using the chain rule.

$$f(x) = (-2x^2 - 6)^{\frac{4}{3}}$$

A $f'(x) = \frac{4}{3}(-2x^2 - 6)^{\frac{1}{3}}(-4x)$

B $f'(x) = \frac{4}{3}(-2x^2 - 6)^{\frac{4}{3}}(-4x)$

C $f'(x) = \frac{4}{3}(-2x^2 - 6)^{\frac{1}{3}}$

D $f'(x) = (-2x^2 - 6)^{\frac{1}{3}}(-4x)$

- 7** Find the derivative $f'(x)$ using the chain rule.

$$f(x) = (x + 2)^{-\frac{1}{2}}$$

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

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

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

- 8** Find the derivative $f'(x)$ using the chain rule.

$$f(x) = \frac{1}{(2x - 3)^3}$$

A $f'(x) = 2(2x - 3)^{-4}$

B $f'(x) = -6(2x - 3)^{-3}$

C $f'(x) = -6(2x - 3)^{-4}$

D $f'(x) = -3(2x - 3)^{-4}$

- 9** Find the derivative $f'(x)$ using the trigonometric rules and the chain rule.

$$f(x) = 2 \cos \left(\frac{1}{x^3} \right)$$

A $f'(x) = -2 \sin \left(\frac{1}{x^3} \right) \cdot \left(-\frac{3}{x^4} \right)$

B $f'(x) = 2 \cos \left(\frac{1}{x^3} \right) \cdot \left(-\frac{3}{x^4} \right)$

C $f'(x) = -2 \sin \left(\frac{1}{x^3} \right)$

D $f'(x) = -2 \sin \left(\frac{1}{x^3} \right) \cdot \left(\frac{1}{x^3} \right)$



Derivatives

- 10** Find the derivative $f'(x)$ using the natural exponential rule and the chain rule.

$$f(x) = 2e^{x^{\frac{3}{2}}}$$

A

$$f'(x) = 2e^{x^{\frac{3}{2}}} \cdot (x^{\frac{3}{2}})$$

B

$$f'(x) = 2(x^{\frac{3}{2}})e^{x^{\frac{3}{2}}-1}$$

C

$$f'(x) = 2e^{x^{\frac{3}{2}}}$$

D

$$f'(x) = 2e^{x^{\frac{3}{2}}} \cdot \frac{3}{2}x^{\frac{1}{2}}$$

- 11** Find the derivative $f'(x)$ using the natural exponential rule and the chain rule.

$$f(x) = 5e^{x^2-x}$$

A

$$f'(x) = 5e^{x^2-x} \cdot (2x-1)$$

B

$$f'(x) = 5e^{x^2-x}$$

C

$$f'(x) = 5e^{x^2-x} \cdot (x^2-x)$$

D

$$f'(x) = 5(x^2-x)e^{x^2-x-1}$$

- 12** Find the derivative $f'(x)$.

$$f(x) = -7\ln(x)$$

A

$$f'(x) = -7x$$

B

$$f'(x) = -\frac{7}{x}$$

C

$$f'(x) = \frac{1}{x}$$

D

$$f'(x) = -\frac{7}{x^2}$$

- 13** Find the derivative $f'(x)$ using the power rule.

$$f(x) = x^{\frac{1}{3}}$$

A

$$f'(x) = \frac{1}{3}x^{\frac{4}{3}}$$

B

$$f'(x) = \frac{1}{3}x^{\frac{1}{3}}$$

C

$$f'(x) = x^{-\frac{2}{3}}$$

D

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

- 14** Find the derivative $f'(x)$ using the sum rule.

$$f(x) = -5x^{-3} + 3x^2$$

A

$$f'(x) = -5x^{-4} + 3x$$

B

$$f'(x) = 15x^{-4} + 6x$$

C

$$f'(x) = 15x^{-3} + 6x^2$$



Derivatives

15 Find the derivative $f'(x)$ using the power rule.

$$f(x) = x^2$$

A	$f'(x) = 2x^3$
B	$f'(x) = 2x$
C	$f'(x) = 2x^2$
D	$f'(x) = x$

16 Find the derivative $f'(x)$ using the power rule.

$$f(x) = x^{-4}$$

A	$f'(x) = x^{-5}$
B	$f'(x) = -4x^{-5}$
C	$f'(x) = -4x^{-3}$
D	$f'(x) = -4x^{-4}$

17 Find the derivative $f'(x)$ using the power rule.

$$f(x) = 8x^5$$

A	$f'(x) = 8x^4$
B	$f'(x) = 40x^5$
C	$f'(x) = 40x^6$
D	$f'(x) = 40x^4$

18 Find the derivative $f'(x)$ using the power rule.

$$f(x) = 8x^{-3}$$

A	$f'(x) = -24x^{-4}$
B	$f'(x) = -24x^{-2}$
C	$f'(x) = -24x^{-3}$
D	$f'(x) = 8x^{-4}$



Derivatives

19 Find the derivative $f'(x)$ using the power rule.

$$f(x) = 2x^{-\frac{5}{2}}$$

A

$$f'(x) = 2x^{-\frac{7}{2}}$$

B

$$f'(x) = -5x^{-\frac{7}{2}}$$

C

$$f'(x) = -5x^{-\frac{3}{2}}$$

D

$$f'(x) = -5x^{-\frac{5}{2}}$$

20 Find the derivative $f'(x)$ using the product rule.

$$\text{if } h(x) = f(x)g(x), \quad h'(x) = f'(x)g(x) + f(x)g'(x)$$

$$[12pt] f(x) = \left(-\frac{2}{x^2} - 6\right)(2x^2)$$

A

$$f'(x) = (4x^{-3})(4x)$$

B

$$f'(x) = (4x^{-3})(2x^2) + (-2x^{-2} - 6)(4x)$$

C

$$f'(x) = (4x^{-3})(2x^2)$$

D

$$f'(x) = (4x^{-3})(2x^2) - (-2x^{-2} - 6)(4x)$$

21 Find the derivative $f'(x)$ using the product rule.

$$f(x) = \left(-\frac{5}{x^3} - 2\right)(-3x - 3)$$

A

$$f'(x) = (15x^{-4})(-3x - 3) + (-5x^{-3} - 2)(-3)$$

B

$$f'(x) = (15x^{-4})(-3x - 3)$$

C

$$f'(x) = (15x^{-4})(-3)$$

D

$$f'(x) = (15x^{-4})(-3x - 3) - (-5x^{-3} - 2)(-3)$$

22 Find the derivative $f'(x)$ using the product rule.

$$\text{if } h(x) = f(x)g(x), \quad h'(x) = f'(x)g(x) + f(x)g'(x)$$

$$[12pt] f(x) = (5\sqrt[3]{x^2} - 5)(3x)$$

A

$$f'(x) = \left(\frac{10}{3}x^{-\frac{1}{3}}\right)(3x) + (5x^{\frac{2}{3}} - 5)(3)$$

B

$$f'(x) = \left(\frac{10}{3}x^{-\frac{1}{3}}\right)(3x) - (5x^{\frac{2}{3}} - 5)(3)$$

C

$$f'(x) = \left(\frac{10}{3}x^{-\frac{1}{3}}\right)(3x)$$

D

$$f'(x) = \left(\frac{10}{3}x^{-\frac{1}{3}}\right)(3)$$



Derivatives

23 Find the derivative $f'(x)$ using the product rule.

$$f(x) = (-5x^{\frac{2}{3}} + 5)(-5x - 2)$$

A

$$f'(x) = (-\frac{10}{3}x^{-\frac{1}{3}})(-5x - 2) - (-5x^{\frac{2}{3}} + 5)(-5)$$

B

$$f'(x) = (-\frac{10}{3}x^{-\frac{1}{3}})(-5x - 2)$$

C

$$f'(x) = (-\frac{10}{3}x^{-\frac{1}{3}})(-5)$$

D

$$f'(x) = (-\frac{10}{3}x^{-\frac{1}{3}})(-5x - 2) + (-5x^{\frac{2}{3}} + 5)(-5)$$

24 Find the derivative $f'(x)$ using the product rule.

$$\text{if } h(x) = f(x)g(x), \quad h'(x) = f'(x)g(x) + f(x)g'(x)$$

$$[12pt] f(x) = (2x^{-3} - 2)(-3x^2 + 5)$$

A

$$f'(x) = (-6x^{-4})(-3x^2 + 5) + (2x^{-3} - 2)(-6x)$$

B

$$f'(x) = (-6x^{-4})(-3x^2 + 5) - (2x^{-3} - 2)(-6x)$$

C

$$f'(x) = (-6x^{-4})(-3x^2 + 5)$$

D

$$f'(x) = (-6x^{-4})(-6x)$$

25 Find the derivative $f'(x)$ using the product rule.

$$\text{if } h(x) = f(x)g(x), \quad h'(x) = f'(x)g(x) + f(x)g'(x)$$

$$[12pt] f(x) = (4x^3 - 2)(2x - 4)$$

A

$$f'(x) = (12x^2)(2x - 4) + (4x^3 - 2)(2)$$

B

$$f'(x) = (12x^2)(2x - 4)$$

C

$$f'(x) = (12x^2)(2x - 4) - (4x^3 - 2)(2)$$

D

$$f'(x) = (12x^2)(2)$$

26 Find the derivative $f'(x)$ using the product rule.

$$\text{if } h(x) = f(x)g(x), \quad h'(x) = f'(x)g(x) + f(x)g'(x)$$

$$[12pt] f(x) = (-3x^{-\frac{1}{2}} - 7)(5x)$$

A

$$f'(x) = (\frac{3}{2}x^{-\frac{3}{2}})(5x)$$

B

$$f'(x) = (\frac{3}{2}x^{-\frac{3}{2}})(5x) + (-3x^{-\frac{1}{2}} - 7)(5)$$

C

$$f'(x) = (\frac{3}{2}x^{-\frac{3}{2}})(5)$$

D

$$f'(x) = (\frac{3}{2}x^{-\frac{3}{2}})(5x) - (-3x^{-\frac{1}{2}} - 7)(5)$$



Derivatives

27 Find the derivative $f'(x)$ using the quotient rule.

$$f(x) = \frac{-4x^3 + 4}{-2x^2 + 4}$$

A
$$f'(x) = \frac{(-12x^2)(-2x^2 + 4) - (-4x^3 + 4)(-4x)}{(-2x^2 + 4)^2}$$

B
$$f'(x) = \frac{(-12x^2)(-2x^2 + 4) + (-4x^3 + 4)(-4x)}{(-2x^2 + 4)^2}$$

C
$$f'(x) = \frac{(-12x^2)(-2x^2 + 4) - (-4x^3 + 4)(-4x)}{(-2x^2 + 4)}$$

D
$$f'(x) = \frac{(-4x^3 + 4)(-4x) - (-12x^2)(-2x^2 + 4)}{(-2x^2 + 4)^2}$$

28 Find the derivative $f'(x)$ using the quotient rule.

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

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

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

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

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

29 Find the derivative $f'(x)$ using the quotient rule.

$$f(x) = \frac{-3x^{\frac{4}{3}} - 2}{4x + 7}$$

A
$$f'(x) = \frac{(-3x^{\frac{4}{3}} - 2)(4) - (-4x^{\frac{1}{3}})(4x + 7)}{(4x + 7)^2}$$

B
$$f'(x) = \frac{(-4x^{\frac{1}{3}})(4x + 7) - (-3x^{\frac{4}{3}} - 2)(4)}{(4x + 7)}$$

C
$$f'(x) = \frac{(-4x^{\frac{1}{3}})(4x + 7) + (-3x^{\frac{4}{3}} - 2)(4)}{(4x + 7)^2}$$

D
$$f'(x) = \frac{(-4x^{\frac{1}{3}})(4x + 7) - (-3x^{\frac{4}{3}} - 2)(4)}{(4x + 7)^2}$$

30 Find the derivative $f'(x)$ using the quotient rule.

$$f(x) = \frac{3x^{-\frac{1}{2}} - 5}{-3x}$$

A
$$f'(x) = \frac{(-\frac{3}{2}x^{-\frac{3}{2}})(-3x) + (3x^{-\frac{1}{2}} - 5)(-3)}{(-3x)^2}$$

B
$$f'(x) = \frac{(-\frac{3}{2}x^{-\frac{3}{2}})(-3x) - (3x^{-\frac{1}{2}} - 5)(-3)}{(-3x)^2}$$

C
$$f'(x) = \frac{(3x^{-\frac{1}{2}} - 5)(-3) - (-\frac{3}{2}x^{-\frac{3}{2}})(-3x)}{(-3x)^2}$$

D
$$f'(x) = \frac{(-\frac{3}{2}x^{-\frac{3}{2}})(-3x) - (3x^{-\frac{1}{2}} - 5)(-3)}{(-3x)}$$



Derivatives

- 31** Find the derivative $f'(x)$ using the quotient, natural exponential, and trigonometric rules.

$$f(x) = \frac{4e^x}{2\cos(x)}$$

A
$$f'(x) = \frac{(4e^x)(2\cos(x)) - (4e^x)(-2\sin(x))}{(2\cos(x))^2}$$

B
$$f'(x) = \frac{(4e^x)(2\cos(x)) + (4e^x)(-2\sin(x))}{(2\cos(x))^2}$$

C
$$f'(x) = \frac{(4e^x)(2\cos(x)) - (4e^x)(-2\sin(x))}{2\cos(x)}$$

D
$$f'(x) = \frac{(4e^x)(-2\sin(x)) - (4e^x)(2\cos(x))}{(2\cos(x))^2}$$

- 34** Find the derivative $f'(x)$ using the sum rule.

$$f(x) = 5x^{\frac{2}{3}} + 5x^3$$

A
$$f'(x) = \frac{10}{3}x^{\frac{2}{3}} + 15x^3$$

B
$$f'(x) = \frac{10}{3}x^{-\frac{1}{3}} + 15x^2$$

C
$$f'(x) = 5x^{-\frac{1}{3}} + 5x^2$$

- 32** Find the derivative $f'(x)$ using the sum rule.

$$f(x) = -2x^3 - 4x + 2$$

A
$$f'(x) = -2x^2 - 4$$

B
$$f'(x) = -6x^3 - 4x$$

C
$$f'(x) = -6x^2 - 4 + 2$$

D
$$f'(x) = -6x^2 - 4$$

- 33** Find the derivative $f'(x)$ using the sum rule.

$$f(x) = -\frac{3}{x^2} - 3$$

A
$$f'(x) = 6x^{-3}$$

B
$$f'(x) = 6x^{-2}$$

C
$$f'(x) = -3x^{-3}$$

D
$$f'(x) = 6x^{-3} - 3$$



Derivatives

35 Find the derivative $f'(x)$ using the sum rule.

$$f(x) = 5x^{-\frac{2}{3}} - 4x^2 + 3x^3$$

A

$$f'(x) = -\frac{10}{3}x^{-\frac{2}{3}} - 8x^2 + 9x^3$$

B

$$f'(x) = -\frac{10}{3}x^{-\frac{5}{3}} - 8x + 9x^2$$

C

$$f'(x) = 5x^{-\frac{5}{3}} - 4x + 3x^2$$

36 Find the derivative $f'(x)$ using the sum rule.

$$f(x) = -\frac{5}{\sqrt{x}} + 4$$

A

$$f'(x) = \frac{5}{2}x^{-\frac{3}{2}}$$

B

$$f'(x) = \frac{5}{2}x^{-\frac{1}{2}}$$

C

$$f'(x) = \frac{5}{2}x^{-\frac{3}{2}} + 4$$

D

$$f'(x) = -5x^{-\frac{3}{2}}$$

37 Find the derivative $f'(x)$ using the sum rule.

$$f(x) = 4\sqrt[3]{x} + 5$$

A

$$f'(x) = \frac{4}{3}x^{-\frac{2}{3}} + 5$$

B

$$f'(x) = 4x^{-\frac{2}{3}}$$

C

$$f'(x) = \frac{4}{3}x^{\frac{1}{3}}$$

D

$$f'(x) = \frac{4}{3}x^{-\frac{2}{3}}$$

38 Find the derivative $f'(x)$ using the trigonometric rules and the chain rule.

$$f(x) = \sin\left(\frac{3}{2}x\right)$$

A

$$f'(x) = \cos\left(\frac{3}{2}x\right) \cdot \left(\frac{3}{2}x\right)$$

B

$$f'(x) = \frac{3}{2}\sin\left(\frac{3}{2}x\right)$$

C

$$f'(x) = \cos\left(\frac{3}{2}x\right)$$

D

$$f'(x) = \frac{3}{2}\cos\left(\frac{3}{2}x\right)$$