

Symbolic Differentials

For each function, find the exact differential $dy = f'(x) \, dx$. Keep the full derivative grouped as the coefficient of dx .

1. $y = 1(2x^3-3x+2)^2$

Find dy .

2. $y = -x^3+5x-2$

Find dy .

3. $y = 4\cos(2x+6)$

Find dy .

4. $y = (2x-3)/(-x+2)$

Find dy .

Symbolic Differentials

For each function, find the exact differential $dy = f'(x) \, dx$. Keep the full derivative grouped as the coefficient of dx .

5. $y = 1(-2x^2+1)^{-2}$

Find dy .

6. $y = -3x^2+2x+7$

Find dy .

7. $y = 2\tan(5x+1)$

Find dy .

8. $y = (2x^2-1)/(x^2+x-1)$

Find dy .

Symbolic Differentials

For each function, find the exact differential $dy = f'(x) \, dx$. Keep the full derivative grouped as the coefficient of dx .

9. $y = 1(x^2+2x-1)^3$

Find dy .

10. $y = x^4-2x^2+3$

Find dy .

Math Sheet

Name _____ Score _____ Teacher _____ Date _____

Symbolic Differentials

Worked Answer Key

For each function, find the exact differential $dy = f'(x) dx$. Keep the full derivative grouped as the coefficient of dx .

1. $y = 1(2x^3 - 3x + 2)^2$

Let $u = 2x^3 - 3x + 2$; then $u' = 6x^2 - 3$.

Chain rule: $1(2)u^1u'$.

$$f'(x) = 2(2x^3 - 3x + 2)^1(6x^2 - 3)$$

Therefore $dy = (2(2x^3 - 3x + 2)(6x^2 - 3)) dx$

2. $y = -x^3 + 5x - 2$

Power rule term by term: $d/dx [-2] = 0$; $d/dx [5x] = 5$; $d/dx [-x^3] = -3x^2$.

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

Therefore $dy = (-3x^2 + 5) dx$

Symbolic Differentials

Worked Answer Key

For each function, find the exact differential $dy = f'(x) dx$. Keep the full derivative grouped as the coefficient of dx .

3. $y = 4\cos(2x+6)$

$$d/dx [\cos(u)] = -\sin(u)u'$$

$$\text{Inner derivative: } u' = 2$$

$$f'(x) = -8\sin(2x+6)$$

Therefore $dy = (-8\sin(2x+6)) dx$

4. $y = (2x-3)/(-x+2)$

$$N = 2x-3; D = -x+2.$$

$$N' = 2; D' = -1.$$

$$\text{Quotient rule: } f' = (N'D - ND')/D^2.$$

$$f'(x) = [(2)(-x+2)-(2x-3)(-1)]/(-x+2)^2$$

Therefore $dy = [(2)(-x+2)-(2x-3)(-1)]/(-x+2)^2 dx$

$$\text{Original domain: } -x+2 \neq 0.$$

Symbolic Differentials

Worked Answer Key

For each function, find the exact differential $dy = f'(x) dx$. Keep the full derivative grouped as the coefficient of dx .

5. $y = 1(-2x^2+1)^{-2}$

Let $u = -2x^2+1$; then $u' = -4x$.

Chain rule: $1(-2)u^{-3}u'$.

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

Therefore $dy = (-2(-2x^2+1)^{-3}(-4x)) dx$

Original domain: $-2x^2+1 \neq 0$.

6. $y = -3x^2+2x+7$

Power rule term by term: $d/dx [7] = 0$; $d/dx [2x] = 2$; $d/dx [-3x^2] = -6x$.

$$f'(x) = -6x+2$$

Therefore $dy = (-6x+2) dx$

Symbolic Differentials

Worked Answer Key

For each function, find the exact differential $dy = f'(x) dx$. Keep the full derivative grouped as the coefficient of dx .

7. $y = 2\tan(5x+1)$

$$d/dx [\tan(u)] = \sec^2(u)u'$$

$$\text{Inner derivative: } u' = 5$$

$$f'(x) = 10\sec^2(5x+1)$$

Therefore $dy = (10\sec^2(5x+1)) dx$

Original domain: $\cos(5x+1) \neq 0$.

8. $y = (2x^2-1)/(x^2+x-1)$

$$N = 2x^2-1; D = x^2+x-1.$$

$$N' = 4x; D' = 2x+1.$$

$$\text{Quotient rule: } f' = (N'D - ND')/D^2.$$

$$f'(x) = [(4x)(x^2+x-1)-(2x^2-1)(2x+1)]/(x^2+x-1)^2$$

Therefore $dy = [(4x)(x^2+x-1)-(2x^2-1)(2x+1)]/(x^2+x-1)^2 dx$

Original domain: $x^2+x-1 \neq 0$.

Symbolic Differentials

Worked Answer Key

For each function, find the exact differential $dy = f'(x) dx$. Keep the full derivative grouped as the coefficient of dx .

9. $y = 1(x^2+2x-1)^3$

Let $u = x^2+2x-1$; then $u' = 2x+2$.

Chain rule: $1(3)u^2u'$.

$$f'(x) = 3(x^2+2x-1)^2(2x+2)$$

Therefore $dy = (3(x^2+2x-1)^2(2x+2)) dx$

10. $y = x^4-2x^2+3$

Power rule term by term: $d/dx [3] = 0$; $d/dx [-2x^2] = -4x$; $d/dx [x^4] = 4x^3$.

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

Therefore $dy = (4x^3-4x) dx$