1. Use the Chain Rule to differentiate. Simplify the answer.
$f(x) = (-2 - x + x^2)\sqrt[3]{-1 + 2x - 2x^2}$

2. Use the Chain Rule to differentiate. Simplify the answer.
$f(x) = (2 - x + 2x^2)\sqrt[3]{-1 - x + x^2}$

3. Use the Chain Rule to differentiate. Simplify the answer.
$f(x) = (-2 + x + 2x^2)^5\sqrt[2]{-2x + 2x^2}$

4. Use the Chain Rule to differentiate. Simplify the answer.
$f(x) = (-2 + 2x + 2x^2)^5\sqrt[3]{x}$

5. Use the Chain Rule to differentiate. Simplify the answer.
$f(x) = (-2 + 2x - x^2)^2\sqrt[5]{-1 + 2x - 2x^2}$

6. Use the Chain Rule to differentiate. Simplify the answer.
$f(x) = (-1 + x - 2x^2)^5\sqrt[4]{2 - x - 2x^2}$

7. Use the Chain Rule to differentiate. Simplify the answer.
$f(x) = (2 + 2x + 2x^2)^2\sqrt[5]{1 + x}$

8. Use the Chain Rule to differentiate. Simplify the answer.
$f(x) = (-1 + x - 2x^2)\sqrt[2]{2 + x + x^2}$

9. Use the Chain Rule to differentiate. Simplify the answer.
$f(x) = (1 + x - x^2)\sqrt[5]{-1 + x + x^2}$

10. Use the Chain Rule to differentiate. Simplify the answer.
$f(x) = (-1 + x - 2x^2)^5\sqrt[3]{x + 2x^2}$

Answers: 1. $f'(x) = \dfrac{\sqrt[3]{-1+2x-2x^2}(-1-6x+24x^2-16x^3)}{3(-1+2x-2x^2)}$

2. $f'(x) = \dfrac{\sqrt[3]{-1-x+x^2}(1-4x-19x^2+16x^3)}{3(-1-x+x^2)}$

3. $f'(x) = \dfrac{(-2+x+2x^2)^4\sqrt[2]{-2x+2x^2}(4-30x-60x^2+88x^3)}{2(-2x+2x^2)}$

4. $f'(x) = \dfrac{(-2+2x+2x^2)^4\sqrt[3]{x}(-2+32x+62x^2)}{3(x)}$

5. $f'(x) = \dfrac{(-2+2x-x^2)\sqrt[5]{-1+2x-2x^2}(-24+72x-90x^2+44x^3)}{5(-1+2x-2x^2)}$

6. $f'(x) = \dfrac{(-1+x-2x^2)^4\sqrt[4]{2-x-2x^2}(41-177x+38x^2+168x^3)}{4(2-x-2x^2)}$

7. $f'(x) = \dfrac{(2+2x+2x^2)\sqrt[5]{1+x}(22+62x+42x^2)}{5(1+x)}$

8. $f'(x) = \dfrac{\sqrt[2]{2+x+x^2}(3-15x-6x^2-12x^3)}{2(2+x+x^2)}$

9. $f'(x) = \dfrac{\sqrt[5]{-1+x+x^2}(-4+18x-4x^2-12x^3)}{5(-1+x+x^2)}$

10. $f'(x) = \dfrac{(-1+x-2x^2)^4\sqrt[3]{x+2x^2}(-1+12x-28x^2-128x^3)}{3(x+2x^2)}$

Solutions:

1. $f'(x) = \frac{\mathrm{d}}{\mathrm{d}x}(-2-x+x^2)\sqrt[3]{-1+2x-2x^2}$

► Apply the Product Rule: $\frac{\mathrm{d}}{\mathrm{d}x}f(x)g(x) = f(x)\frac{\mathrm{d}}{\mathrm{d}x}g(x) + g(x)\frac{\mathrm{d}}{\mathrm{d}x}f(x)$

$f'(x) = \sqrt[3]{-1+2x-2x^2}\frac{\mathrm{d}}{\mathrm{d}x}(-2-x+x^2) + (-2-x+x^2)\frac{\mathrm{d}}{\mathrm{d}x}(-1+2x-2x^2)^{\frac{1}{3}}$

► Apply the Chain Rule: $\frac{\mathrm{d}}{\mathrm{d}x}f(x)^n = nf(x)^{n-1}\frac{\mathrm{d}}{\mathrm{d}x}f(x)$

$f'(x) = \sqrt[3]{-1+2x-2x^2}(1)\frac{\mathrm{d}}{\mathrm{d}x}(-2-x+x^2) + (-2-x+x^2)\frac{1}{3}(-1+2x-2x^2)^{\frac{1}{3}-1}\frac{\mathrm{d}}{\mathrm{d}x}(-1+2x-2x^2)$

► Apply the Power Rule: $\frac{\mathrm{d}}{\mathrm{d}x}x^n = nx^{n-1}$

$f'(x) = \sqrt[3]{-1+2x-2x^2}(1)(-1+2x) + (-2-x+x^2)\frac{1}{3}\frac{\sqrt[3]{-1+2x-2x^2}}{-1+2x-2x^2}(2-4x)$

► Find the Least common Denominator

$f'(x) = \frac{(3)(-1+2x-2x^2)}{(3)(-1+2x-2x^2)}\sqrt[3]{-1+2x-2x^2}(1)(-1+2x) + (-2-x+x^2)\frac{1}{3}\frac{\sqrt[3]{-1+2x-2x^2}}{-1+2x-2x^2}(2-4x)$

► Factor the Common Factors

$f'(x) = \frac{\sqrt[3]{-1+2x-2x^2}[(1)(3)(-1+2x-2x^2)(-1+2x) + (-2-x+x^2)(2-4x)]}{(3)(-1+2x-2x^2)}$

► Expand and simplify

$f'(x) = \frac{\sqrt[3]{-1+2x-2x^2}(-1-6x+24x^2-16x^3)}{3(-1+2x-2x^2)}$

2. $f'(x) = \frac{\mathrm{d}}{\mathrm{d}x}(2-x+2x^2)\sqrt[3]{-1-x+x^2}$

► Apply the Product Rule: $\frac{\mathrm{d}}{\mathrm{d}x}f(x)g(x) = f(x)\frac{\mathrm{d}}{\mathrm{d}x}g(x) + g(x)\frac{\mathrm{d}}{\mathrm{d}x}f(x)$

$f'(x) = \sqrt[3]{-1-x+x^2}\frac{\mathrm{d}}{\mathrm{d}x}(2-x+2x^2) + (2-x+2x^2)\frac{\mathrm{d}}{\mathrm{d}x}(-1-x+x^2)^{\frac{1}{3}}$

► Apply the Chain Rule: $\frac{\mathrm{d}}{\mathrm{d}x}f(x)^n = nf(x)^{n-1}\frac{\mathrm{d}}{\mathrm{d}x}f(x)$

$f'(x) = \sqrt[3]{-1-x+x^2}(1)\frac{\mathrm{d}}{\mathrm{d}x}(2-x+2x^2) + (2-x+2x^2)\frac{1}{3}(-1-x+x^2)^{\frac{1}{3}-1}\frac{\mathrm{d}}{\mathrm{d}x}(-1-x+x^2)$

► Apply the Power Rule: $\frac{\mathrm{d}}{\mathrm{d}x}x^n = nx^{n-1}$

$f'(x) = \sqrt[3]{-1-x+x^2}(1)(-1+4x) + (2-x+2x^2)\frac{1}{3}\frac{\sqrt[3]{-1-x+x^2}}{-1-x+x^2}(-1+2x)$

► Find the Least common Denominator

$f'(x) = \frac{(3)(-1-x+x^2)}{(3)(-1-x+x^2)}\sqrt[3]{-1-x+x^2}(1)(-1+4x) + (2-x+2x^2)\frac{1}{3}\frac{\sqrt[3]{-1-x+x^2}}{-1-x+x^2}(-1+2x)$

► Factor the Common Factors

$f'(x) = \frac{\sqrt[3]{-1-x+x^2}[(1)(3)(-1-x+x^2)(-1+4x) + (2-x+2x^2)(-1+2x)]}{(3)(-1-x+x^2)}$

► Expand and simplify

$f'(x) = \dfrac{\sqrt[3]{-1-x+x^2}(1-4x-19x^2+16x^3)}{3(-1-x+x^2)}$

3. $f'(x) = \dfrac{\mathrm{d}}{\mathrm{d}x}(-2+x+2x^2)^5\sqrt[2]{-2x+2x^2}$

► Apply the Product Rule: $\dfrac{\mathrm{d}}{\mathrm{d}x}f(x)g(x) = f(x)\dfrac{\mathrm{d}}{\mathrm{d}x}g(x) + g(x)\dfrac{\mathrm{d}}{\mathrm{d}x}f(x)$

$f'(x) = \sqrt[2]{-2x+2x^2}\dfrac{\mathrm{d}}{\mathrm{d}x}(-2+x+2x^2)^5 + (-2+x+2x^2)^5\dfrac{\mathrm{d}}{\mathrm{d}x}(-2x+2x^2)^{\frac{1}{2}}$

► Apply the Chain Rule: $\dfrac{\mathrm{d}}{\mathrm{d}x}f(x)^n = nf(x)^{n-1}\dfrac{\mathrm{d}}{\mathrm{d}x}f(x)$

$f'(x) = \sqrt[2]{-2x+2x^2}(5)(-2+x+2x^2)^4\dfrac{\mathrm{d}}{\mathrm{d}x}(-2+x+2x^2) + (-2+x+2x^2)^5\dfrac{1}{2}(-2x+2x^2)^{\frac{1}{2}-1}\dfrac{\mathrm{d}}{\mathrm{d}x}(-2x+2x^2)$

► Apply the Power Rule: $\dfrac{\mathrm{d}}{\mathrm{d}x}x^n = nx^{n-1}$

$f'(x) = \sqrt[2]{-2x+2x^2}(5)(-2+x+2x^2)^4(1+4x) + (-2+x+2x^2)^5\dfrac{1}{2}\dfrac{\sqrt[2]{-2x+2x^2}}{-2x+2x^2}(-2+4x)$

► Find the Least common Denominator

$f'(x) = \dfrac{(2)(-2x+2x^2)}{(2)(-2x+2x^2)}\sqrt[2]{-2x+2x^2}(5)(-2+x+2x^2)^4(1+4x) + (-2+x+2x^2)^5\dfrac{1}{2}\dfrac{\sqrt[2]{-2x+2x^2}}{-2x+2x^2}(-2+4x)$

► Factor the Common Factors

$f'(x) = \dfrac{\sqrt[2]{-2x+2x^2}(-2+x+2x^2)^4[(5)(2)(-2x+2x^2)(1+4x) + (-2+x+2x^2)(-2+4x)]}{(2)(-2x+2x^2)}$

► Expand and simplify

$f'(x) = \dfrac{(-2+x+2x^2)^4\sqrt[2]{-2x+2x^2}(4-30x-60x^2+88x^3)}{2(-2x+2x^2)}$

4. $f'(x) = \dfrac{\mathrm{d}}{\mathrm{d}x}(-2+2x+2x^2)^5\sqrt[3]{x}$

► Apply the Product Rule: $\dfrac{\mathrm{d}}{\mathrm{d}x}f(x)g(x) = f(x)\dfrac{\mathrm{d}}{\mathrm{d}x}g(x) + g(x)\dfrac{\mathrm{d}}{\mathrm{d}x}f(x)$

$f'(x) = \sqrt[3]{x}\dfrac{\mathrm{d}}{\mathrm{d}x}(-2+2x+2x^2)^5 + (-2+2x+2x^2)^5\dfrac{\mathrm{d}}{\mathrm{d}x}(x)^{\frac{1}{3}}$

► Apply the Chain Rule: $\dfrac{\mathrm{d}}{\mathrm{d}x}f(x)^n = nf(x)^{n-1}\dfrac{\mathrm{d}}{\mathrm{d}x}f(x)$

$f'(x) = \sqrt[3]{x}(5)(-2+2x+2x^2)^4\dfrac{\mathrm{d}}{\mathrm{d}x}(-2+2x+2x^2) + (-2+2x+2x^2)^5\dfrac{1}{3}(x)^{\frac{1}{3}-1}\dfrac{\mathrm{d}}{\mathrm{d}x}(x)$

► Apply the Power Rule: $\dfrac{\mathrm{d}}{\mathrm{d}x}x^n = nx^{n-1}$

$f'(x) = \sqrt[3]{x}(5)(-2+2x+2x^2)^4(2+4x) + (-2+2x+2x^2)^5\dfrac{1}{3}\dfrac{\sqrt[3]{x}}{x}(1)$

► Find the Least common Denominator

$f'(x) = \dfrac{(3)(x)}{(3)(x)}\sqrt[3]{x}(5)(-2+2x+2x^2)^4(2+4x) + (-2+2x+2x^2)^5\dfrac{1}{3}\dfrac{\sqrt[3]{x}}{x}(1)$

► Factor the Common Factors

$f'(x) = \dfrac{\sqrt[3]{x}(-2+2x+2x^2)^4[(5)(3)(x)(2+4x) + (-2+2x+2x^2)(1)]}{(3)(x)}$

► Expand and simplify

$f'(x) = \dfrac{(-2+2x+2x^2)^4\sqrt[3]{x}(-2+32x+62x^2)}{3(x)}$

5. $f'(x) = \dfrac{\mathrm{d}}{\mathrm{d}x}(-2+2x-x^2)^2\sqrt[5]{-1+2x-2x^2}$

▶ Apply the Product Rule: $\dfrac{\mathrm{d}}{\mathrm{d}x}f(x)g(x) = f(x)\dfrac{\mathrm{d}}{\mathrm{d}x}g(x) + g(x)\dfrac{\mathrm{d}}{\mathrm{d}x}f(x)$

$f'(x) = \sqrt[5]{-1+2x-2x^2}\dfrac{\mathrm{d}}{\mathrm{d}x}(-2+2x-x^2)^2 + (-2+2x-x^2)^2\dfrac{\mathrm{d}}{\mathrm{d}x}(-1+2x-2x^2)^{\frac{1}{5}}$

▶ Apply the Chain Rule: $\dfrac{\mathrm{d}}{\mathrm{d}x}f(x)^n = nf(x)^{n-1}\dfrac{\mathrm{d}}{\mathrm{d}x}f(x)$

$f'(x) = \sqrt[5]{-1+2x-2x^2}(2)(-2+2x-x^2)\dfrac{\mathrm{d}}{\mathrm{d}x}(-2+2x-x^2) + (-2+2x-x^2)^2\dfrac{1}{5}(-1+2x-2x^2)^{\frac{1}{5}-1}\dfrac{\mathrm{d}}{\mathrm{d}x}(-1+2x-2x^2)$

▶ Apply the Power Rule: $\dfrac{\mathrm{d}}{\mathrm{d}x}x^n = nx^{n-1}$

$f'(x) = \sqrt[5]{-1+2x-2x^2}(2)(-2+2x-x^2)(2-2x) + (-2+2x-x^2)^2\dfrac{1}{5}\dfrac{\sqrt[5]{-1+2x-2x^2}}{-1+2x-2x^2}(2-4x)$

▶ Find the Least common Denominator

$f'(x) = \dfrac{(5)(-1+2x-2x^2)}{(5)(-1+2x-2x^2)}\sqrt[5]{-1+2x-2x^2}(2)(-2+2x-x^2)(2-2x) + (-2+2x-x^2)^2\dfrac{1}{5}\dfrac{\sqrt[5]{-1+2x-2x^2}}{-1+2x-2x^2}(2-4x)$

▶ Factor the Common Factors

$f'(x) = \dfrac{\sqrt[5]{-1+2x-2x^2}(-2+2x-x^2)[(2)(5)(-1+2x-2x^2)(2-2x) + (-2+2x-x^2)(2-4x)]}{(5)(-1+2x-2x^2)}$

▶ Expand and simplify

$f'(x) = \dfrac{(-2+2x-x^2)\sqrt[5]{-1+2x-2x^2}(-24+72x-90x^2+44x^3)}{5(-1+2x-2x^2)}$

6. $f'(x) = \dfrac{\mathrm{d}}{\mathrm{d}x}(-1+x-2x^2)^5\sqrt[4]{2-x-2x^2}$

▶ Apply the Product Rule: $\dfrac{\mathrm{d}}{\mathrm{d}x}f(x)g(x) = f(x)\dfrac{\mathrm{d}}{\mathrm{d}x}g(x) + g(x)\dfrac{\mathrm{d}}{\mathrm{d}x}f(x)$

$f'(x) = \sqrt[4]{2-x-2x^2}\dfrac{\mathrm{d}}{\mathrm{d}x}(-1+x-2x^2)^5 + (-1+x-2x^2)^5\dfrac{\mathrm{d}}{\mathrm{d}x}(2-x-2x^2)^{\frac{1}{4}}$

▶ Apply the Chain Rule: $\dfrac{\mathrm{d}}{\mathrm{d}x}f(x)^n = nf(x)^{n-1}\dfrac{\mathrm{d}}{\mathrm{d}x}f(x)$

$f'(x) = \sqrt[4]{2-x-2x^2}(5)(-1+x-2x^2)^4\dfrac{\mathrm{d}}{\mathrm{d}x}(-1+x-2x^2) + (-1+x-2x^2)^5\dfrac{1}{4}(2-x-2x^2)^{\frac{1}{4}-1}\dfrac{\mathrm{d}}{\mathrm{d}x}(2-x-2x^2)$

▶ Apply the Power Rule: $\dfrac{\mathrm{d}}{\mathrm{d}x}x^n = nx^{n-1}$

$f'(x) = \sqrt[4]{2-x-2x^2}(5)(-1+x-2x^2)^4(1-4x) + (-1+x-2x^2)^5\dfrac{1}{4}\dfrac{\sqrt[4]{2-x-2x^2}}{2-x-2x^2}(-1-4x)$

▶ Find the Least common Denominator

$f'(x) = \dfrac{(4)(2-x-2x^2)}{(4)(2-x-2x^2)}\sqrt[4]{2-x-2x^2}(5)(-1+x-2x^2)^4(1-4x) + (-1+x-2x^2)^5\dfrac{1}{4}\dfrac{\sqrt[4]{2-x-2x^2}}{2-x-2x^2}(-1-4x)$

▶ Factor the Common Factors

$$f'(x) = \frac{\sqrt[4]{2-x-2x^2}(-1+x-2x^2)^4[(5)(4)(2-x-2x^2)(1-4x)+(-1+x-2x^2)(-1-4x)]}{(4)(2-x-2x^2)}$$

▶ Expand and simplify

$$f'(x) = \frac{(-1+x-2x^2)^4\sqrt[4]{2-x-2x^2}(41-177x+38x^2+168x^3)}{4(2-x-2x^2)}$$

7. $f'(x) = \frac{\mathrm{d}}{\mathrm{d}x}(2+2x+2x^2)^2\sqrt[5]{1+x}$

▶ Apply the Product Rule: $\frac{\mathrm{d}}{\mathrm{d}x}f(x)g(x) = f(x)\frac{\mathrm{d}}{\mathrm{d}x}g(x) + g(x)\frac{\mathrm{d}}{\mathrm{d}x}f(x)$

$$f'(x) = \sqrt[5]{1+x}\frac{\mathrm{d}}{\mathrm{d}x}(2+2x+2x^2)^2 + (2+2x+2x^2)^2\frac{\mathrm{d}}{\mathrm{d}x}(1+x)^{\frac{1}{5}}$$

▶ Apply the Chain Rule: $\frac{\mathrm{d}}{\mathrm{d}x}f(x)^n = nf(x)^{n-1}\frac{\mathrm{d}}{\mathrm{d}x}f(x)$

$$f'(x) = \sqrt[5]{1+x}(2)(2+2x+2x^2)\frac{\mathrm{d}}{\mathrm{d}x}(2+2x+2x^2) + (2+2x+2x^2)^2\frac{1}{5}(1+x)^{\frac{1}{5}-1}\frac{\mathrm{d}}{\mathrm{d}x}(1+x)$$

▶ Apply the Power Rule: $\frac{\mathrm{d}}{\mathrm{d}x}x^n = nx^{n-1}$

$$f'(x) = \sqrt[5]{1+x}(2)(2+2x+2x^2)(2+4x) + (2+2x+2x^2)^2\frac{1}{5}\frac{\sqrt[5]{1+x}}{1+x}(1)$$

▶ Find the Least common Denominator

$$f'(x) = \frac{(5)(1+x)}{(5)(1+x)}\sqrt[5]{1+x}(2)(2+2x+2x^2)(2+4x) + (2+2x+2x^2)^2\frac{1}{5}\frac{\sqrt[5]{1+x}}{1+x}(1)$$

▶ Factor the Common Factors

$$f'(x) = \frac{\sqrt[5]{1+x}(2+2x+2x^2)[(2)(5)(1+x)(2+4x)+(2+2x+2x^2)(1)]}{(5)(1+x)}$$

▶ Expand and simplify

$$f'(x) = \frac{(2+2x+2x^2)\sqrt[5]{1+x}(22+62x+42x^2)}{5(1+x)}$$

8. $f'(x) = \frac{\mathrm{d}}{\mathrm{d}x}(-1+x-2x^2)\sqrt[2]{2+x+x^2}$

▶ Apply the Product Rule: $\frac{\mathrm{d}}{\mathrm{d}x}f(x)g(x) = f(x)\frac{\mathrm{d}}{\mathrm{d}x}g(x) + g(x)\frac{\mathrm{d}}{\mathrm{d}x}f(x)$

$$f'(x) = \sqrt[2]{2+x+x^2}\frac{\mathrm{d}}{\mathrm{d}x}(-1+x-2x^2) + (-1+x-2x^2)\frac{\mathrm{d}}{\mathrm{d}x}(2+x+x^2)^{\frac{1}{2}}$$

▶ Apply the Chain Rule: $\frac{\mathrm{d}}{\mathrm{d}x}f(x)^n = nf(x)^{n-1}\frac{\mathrm{d}}{\mathrm{d}x}f(x)$

$$f'(x) = \sqrt[2]{2+x+x^2}(1)\frac{\mathrm{d}}{\mathrm{d}x}(-1+x-2x^2) + (-1+x-2x^2)\frac{1}{2}(2+x+x^2)^{\frac{1}{2}-1}\frac{\mathrm{d}}{\mathrm{d}x}(2+x+x^2)$$

▶ Apply the Power Rule: $\frac{\mathrm{d}}{\mathrm{d}x}x^n = nx^{n-1}$

$$f'(x) = \sqrt[2]{2+x+x^2}(1)(1-4x) + (-1+x-2x^2)\frac{1}{2}\frac{\sqrt[2]{2+x+x^2}}{2+x+x^2}(1+2x)$$

▶ Find the Least common Denominator

$$f'(x) = \frac{(2)(2+x+x^2)}{(2)(2+x+x^2)}\sqrt[2]{2+x+x^2}(1)(1-4x) + (-1+x-2x^2)\frac{1}{2}\frac{\sqrt[2]{2+x+x^2}}{2+x+x^2}(1+2x)$$

▶ Factor the Common Factors

$$f'(x) = \frac{\sqrt[2]{2+x+x^2}[(1)(2)(2+x+x^2)(1-4x)+(-1+x-2x^2)(1+2x)]}{(2)(2+x+x^2)}$$

▶ Expand and simplify

$$f'(x) = \frac{\sqrt[2]{2+x+x^2}(3-15x-6x^2-12x^3)}{2(2+x+x^2)}$$

9. $f'(x) = \frac{\mathrm{d}}{\mathrm{d}x}(1+x-x^2)\sqrt[5]{-1+x+x^2}$

▶ Apply the Product Rule: $\frac{\mathrm{d}}{\mathrm{d}x}f(x)g(x) = f(x)\frac{\mathrm{d}}{\mathrm{d}x}g(x) + g(x)\frac{\mathrm{d}}{\mathrm{d}x}f(x)$

$$f'(x) = \sqrt[5]{-1+x+x^2}\frac{\mathrm{d}}{\mathrm{d}x}(1+x-x^2) + (1+x-x^2)\frac{\mathrm{d}}{\mathrm{d}x}(-1+x+x^2)^{\frac{1}{5}}$$

▶ Apply the Chain Rule: $\frac{\mathrm{d}}{\mathrm{d}x}f(x)^n = nf(x)^{n-1}\frac{\mathrm{d}}{\mathrm{d}x}f(x)$

$$f'(x) = \sqrt[5]{-1+x+x^2}(1)\frac{\mathrm{d}}{\mathrm{d}x}(1+x-x^2) + (1+x-x^2)\frac{1}{5}(-1+x+x^2)^{\frac{1}{5}-1}\frac{\mathrm{d}}{\mathrm{d}x}(-1+x+x^2)$$

▶ Apply the Power Rule: $\frac{\mathrm{d}}{\mathrm{d}x}x^n = nx^{n-1}$

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

▶ Find the Least common Denominator

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

▶ Factor the Common Factors

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

▶ Expand and simplify

$$f'(x) = \frac{\sqrt[5]{-1+x+x^2}(-4+18x-4x^2-12x^3)}{5(-1+x+x^2)}$$

10. $f'(x) = \frac{\mathrm{d}}{\mathrm{d}x}(-1+x-2x^2)^5\sqrt[3]{x+2x^2}$

▶ Apply the Product Rule: $\frac{\mathrm{d}}{\mathrm{d}x}f(x)g(x) = f(x)\frac{\mathrm{d}}{\mathrm{d}x}g(x) + g(x)\frac{\mathrm{d}}{\mathrm{d}x}f(x)$

$$f'(x) = \sqrt[3]{x+2x^2}\frac{\mathrm{d}}{\mathrm{d}x}(-1+x-2x^2)^5 + (-1+x-2x^2)^5\frac{\mathrm{d}}{\mathrm{d}x}(x+2x^2)^{\frac{1}{3}}$$

▶ Apply the Chain Rule: $\frac{\mathrm{d}}{\mathrm{d}x}f(x)^n = nf(x)^{n-1}\frac{\mathrm{d}}{\mathrm{d}x}f(x)$

$$f'(x) = \sqrt[3]{x+2x^2}(5)(-1+x-2x^2)^4\frac{\mathrm{d}}{\mathrm{d}x}(-1+x-2x^2) + (-1+x-2x^2)^5\frac{1}{3}(x+2x^2)^{\frac{1}{3}-1}\frac{\mathrm{d}}{\mathrm{d}x}(x+2x^2)$$

▶ Apply the Power Rule: $\frac{\mathrm{d}}{\mathrm{d}x}x^n = nx^{n-1}$

$$f'(x) = \sqrt[3]{x+2x^2}(5)(-1+x-2x^2)^4(1-4x) + (-1+x-2x^2)^5\frac{1}{3}\frac{\sqrt[3]{x+2x^2}}{x+2x^2}(1+4x)$$

▶ Find the Least common Denominator

$$f'(x) = \frac{(3)(x+2x^2)}{(3)(x+2x^2)}\sqrt[3]{x+2x^2}(5)(-1+x-2x^2)^4(1-4x) + (-1+x-2x^2)^5\frac{1}{3}\frac{\sqrt[3]{x+2x^2}}{x+2x^2}(1+4x)$$

► Factor the Common Factors

$$f'(x) = \frac{\sqrt[3]{x+2x^2}(-1+x-2x^2)^4[(5)(3)(x+2x^2)(1-4x)+(-1+x-2x^2)(1+4x)]}{(3)(x+2x^2)}$$

► Expand and simplify

$$f'(x) = \frac{(-1+x-2x^2)^4\sqrt[3]{x+2x^2}(-1+12x-28x^2-128x^3)}{3(x+2x^2)}$$

