NOTES Section 4.1 Shortcut to use for Chapter 3 Test.

- Power Rule Method: $f(x) = x^n$

Thus, $f'(x) = nx^{n-1}$

(multiply then ~~substitute~~ subtract)

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

Step 1 $f'(x) = 2 * x^{2-1}$

Step 2 $f'(x) = 2x$

works on about 50% of core rules.

Ex: $f(x) = 3x^4 + 2x^2 - x + 1$

Step 1 $3 * x^{4-1} + 2 * x^{2-1} - x^{1-1} + 1$ (my guess?)

$= 3x^3 + 2x + 1$

Step 1 $f'x = 12x^3 + 4x - 1 + 1(x^0)$

disappears

Step 2 $f'x = 12x^3 + 4x - 1$

Step 3 $f''(x) = 36x^2 + 4$

Step 4 $f'''(x) = 72x$

Step 5 $f^{(4)}(x) = 72$

Example $f(x) = 4x^{\frac{1}{2}} + 3x^7 - 2x^{\frac{3}{4}} + 5$

Step 1 $4(\frac{1}{2}) * x^{\frac{1}{2}-1} + 3(7) * x^{7-1} - 2(\frac{3}{4}) * x^{\frac{3}{4}-1} + \cancel{5(x^0)}$

cancels

$f'(x)\ 2x^{-\frac{1}{2}} + 21x^6 - 1.5x^{-.25}$ (my guess?)

$f'(x) = 2x^{-\frac{1}{2}} + 21x^6 - \frac{3}{2}x^{-\frac{1}{4}}$ or $\frac{2}{x^{\frac{1}{2}}} + 21x^6 - \frac{3}{2x^{\frac{1}{4}}}$

#53 Revisit with new technique

$f(x) = \sqrt{x}$

$\boxed{\text{Step 1}}$ we know that $f(x) = \sqrt{x} = \sqrt[n]{x^m} = x^{m/n}$

, so $f(x) = x^{\frac{1}{2}}$

$\boxed{\text{Step 2}}$ $f'(x) = \frac{1}{2} x^{-\frac{1}{2}} = \frac{1}{2x^{\frac{1}{2}}}$ or $= \frac{1}{2\sqrt{x}}$

Example: $f(x) = 2x^{-\frac{2}{3}} + 5x^{-4} - 3x^{\frac{3}{4}} + 7x^{12} + 2$

$\boxed{\text{Step 1}}$ $2(-\frac{2}{3}) * x^{-\frac{2}{3}-1} + 5(-4) * x^{-4-1} - 3(\frac{3}{4}) * x^{\frac{3}{4}-1} + 7(12) * x^{12-1} + 2(x^0)$

$\boxed{\text{Step 2}}$ $-1.333x^{-1.667} - 20x^{-5} - 2.25x^{-.25} + 84x^{11}$

or

$f'(x)$ $\frac{-1.333}{x^{1.667}} - \frac{20}{x^5} - \frac{2.25}{x^{.25}} + 84x^{11}$

Alternate way to write step2 by keeping fractions

$f'(x) = -\frac{4}{3}x^{-\frac{5}{3}} - 20x^{-5} - \frac{9}{4}x^{-\frac{1}{4}} + 84x^{11}$

or

$\frac{-4}{3x^{\frac{5}{3}}} - \frac{20}{x^5} - \frac{9}{4x^{\frac{1}{4}}} + 84x^{11}$

* multiple choice may not be available in decimal format.

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

$\boxed{\text{Step 1}}$ move denominator powers to numerator

, so $2x^{-1} + 5x^{-3} - 1$

$\boxed{\text{Step 2}}$ $2(-1) * x^{-1-1} + 5(-3) * x^{-3-1} - 1$

$\boxed{\text{Step 3}}$ $-2x^{-2} + (-15x^{-4}) - 1(x^0) = -2x^{-2} - 15x^{-4} =$

$\frac{-2}{x^2} - \frac{15}{x^4}$