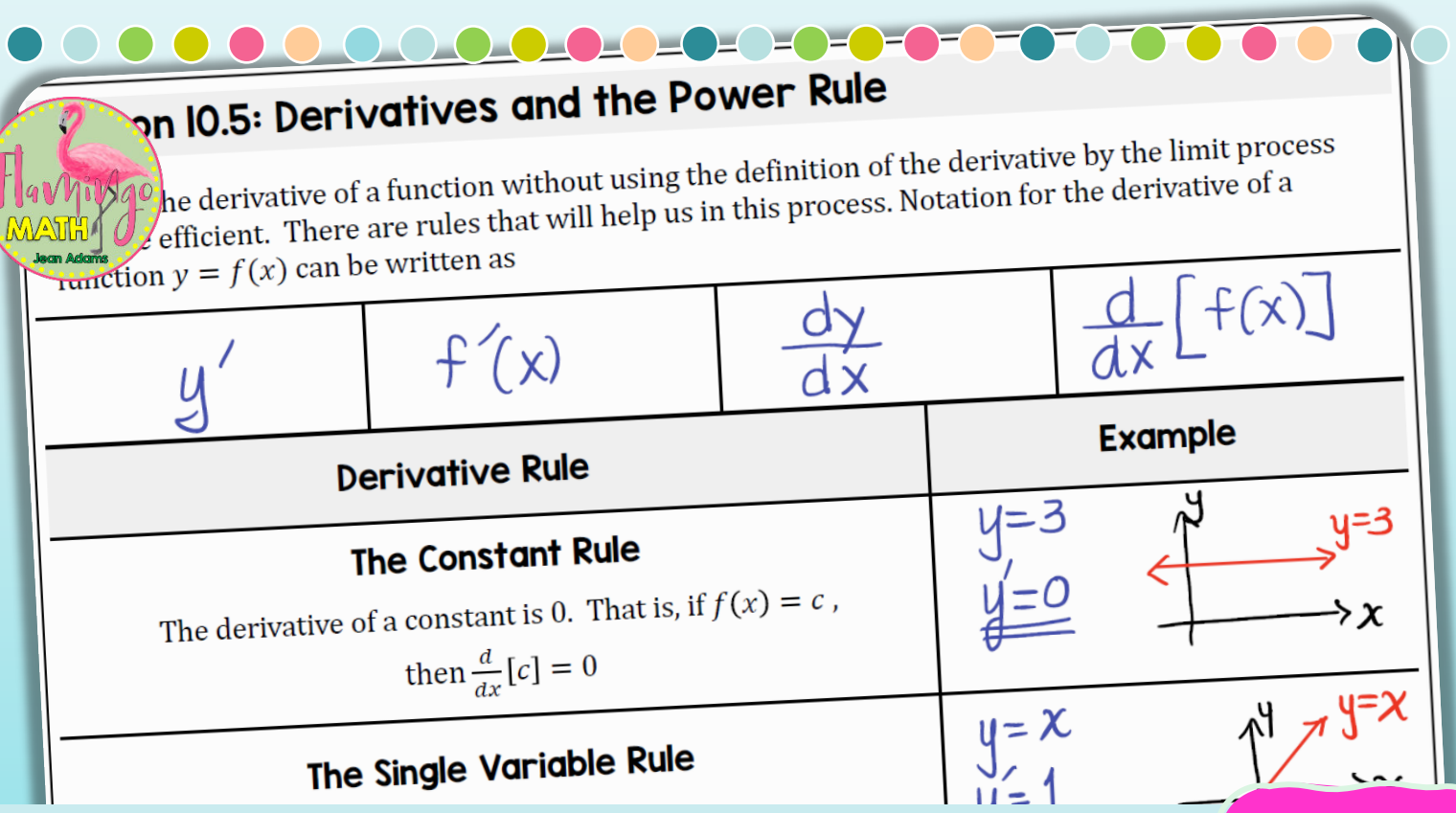
Precalculus Honors

Derivatives and The Power Rule



on 10.5: Derivatives and the Power Rule

he derivative of a function without using the definition of the derivative by the limit process efficient. There are rules that will help us in this process. Notation for the derivative of a function $y = f(x)$ can be written as

y'	$f'(x)$	$\frac{dy}{dx}$	$\frac{d}{dx}[f(x)]$

Derivative Rule	Example
The Constant Rule The derivative of a constant is 0. That is, if $f(x) = c$, then $\frac{d}{dx}[c] = 0$	$y=3$ $y'=0$ y, y=3, x
The Single Variable Rule	$y=x$ $y'=1$ y, y=x

Flamingo MATH Jean Adams

Completely Editable 10.5

Lesson 10.5: Derivatives and the Power Rule

To find the derivative of a function without using the definition of the derivative by the limit process is more efficient. There are rules that will help us in this process. Notation for the derivative of a function $y = f(x)$ can be written as

Derivative Rule	Example
The Constant Rule The derivative of a constant is 0. That is, if $f(x) = c$, then $\frac{d}{dx}[c] = 0$	
The Single Variable Rule The derivative of x is 1. $\frac{d}{dx}[x] = 1$. Consider the graph of $y = x$, with a slope of 1.	
The Power Rule If $f(x) = x^n$, then $f'(x) = nx^{n-1}$	
Constant Multiple Rule If $f(x) = kx^n$, then $f'(x) = k \cdot f'(x)$ or $f'(x) = k \cdot nx^{n-1}$	
Sum and Difference Rules $\frac{d}{dx}[f(x) \pm g(x)] = f'(x) \pm g'(x)$	

Finding the Deriva

EX #1: Find the derivative of each constant function.

A. $y = 3$ **B.** $f(x) = -5$

EX #2: Find the derivative of each linear function.

A. $y = 8x$ **B.** $f(x) = -3x + 5$ **C.** $s(t) = et$

Polynomials and the Derivative

EX #3: Find the derivative of each polynomial function using the power rule. Use proper notation.

A. $y = x^5$

B. $f(x) = 6x^3 - 5x^2 + 3x - 4$

C. $s(t) = -16t^2 + 96t + 85$

D. $g(x) = 0.2x^{10} - 0.5x^2 + 0.6x - 0.25$

E. $y = \frac{1}{4}x^4 - \frac{2}{3}x^3 + \frac{1}{2}x^2 - 3x + 2$

e & Fraction Powers

cools in re-writing expressions in order to use

$\sqrt{b} = b^{\frac{1}{2}}$	$\sqrt[n]{b^m} = b^{\frac{m}{n}}$

EX. #4: Find the derivatives for each of the following.

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

B. $g(x) = \frac{4}{x^3} - \frac{2}{x^2} + 5x - \frac{1}{x}$

C. $h(x) = \frac{7x^4 + x^3 - 5x^2 - 3x + 8}{x}$

More Deriva

EX #5: Find each derivative.

A. $f(x) = (3x - 2)(x + 3)$

B. $s(t) = \frac{7x^3 - 2x^2 + 4x}{\sqrt{x}}$

C. $y = 5\sqrt{x}(\sqrt[3]{x} - 4x + 6)$

Finding a Derivative at

EX #6: Find the derivative at the indicated value.

A. $f(x) = (3x - 2)^2$ at $x = -1$

B. $f'(16)$ for $f(x) = 3\sqrt[4]{x} - 4\sqrt{x} + 2x$

Equation of the Tangent Line

EX #7: Write the equation of the tangent line at each indicated point.

A. $f(x) = \sqrt{x + 2}$ for $(-1,1)$

B. $f(x) = x + \frac{3}{x}$ at $x = -3$

NOTES

10.5 **Derivatives and the Power Rule Homework**

Name _____

Date _____ Period _____

Problems 1 – 12, find the derivative for each of the following using the power rule for polynomials.

1. $y = 9$	2. $y = 8x - 7$
3. $f(x) = 3x^5 - 4x^3$	4. $f(x) = 7x^3 + 6x^2 - 5x$
5. $g(x) = \frac{1}{2}x^6 - \frac{2}{3}x^3 + 4x - 3$	6. $h(x) = (2x - 5)^2$
7. $f(x) = x(2x + 3)(x - 4)$	8. $g(x) = 0.2x^4 - 0.5x^3 - 0.3x^2 - 1.4x$
9. $y = -3x^2(x - 5)^2$	10. $g(x) = (x + 2)^3$
11. $h(x) = \frac{4}{5}x^8 - \frac{2}{3}x^6 - \frac{3}{4}x^4 + \frac{5}{2}x^2$	12. $y = \frac{1}{2}(3x - 4)^2$

Problems 13 – 20, Use algebraic techniques to rewrite first, then find the derivative of the function.

13. $f(x) = 3x - \sqrt{x}$	14. $f(x) = \frac{1}{\sqrt[3]{x^2}}$
15. $g(x) = x + 9\sqrt[3]{x}$	16. $f(x) = \frac{x^2+8}{x+2}$
17. $f(x) = \frac{4}{\sqrt{x}}$	18. $g(x) = \frac{1}{(x+3)^2}$
19. $h(x) = \frac{x-6\sqrt{x}}{3x}$	20. $y = \frac{x^2-4x^2+6x+5}{x}$

Problems 21 – 24, find $f'(x)$ for the indicated value of x for each function. Then write the equation for the tangent line at the given x-value.

21. $f(x) = 3x^2 - 2x + 4$ at $x = -1$	22. $g(x) = 2 - (x - 1)^2$ at $x = -2$
23. $y = \sqrt{x + 2}$ at $x = -1$	24. $h(x) = \frac{2}{x}$ at $x = -1$

Problems 25 – 28, solve.

25. Find all the points on the graph of $y = x^3 - x^2$ where the tangent line is horizontal.	26. Find all the points on the graph of $y = x^3 + 2x^2 - 3x + 1$ where the tangent line has a slope of 1.

Practice Sets

Lesson Warm-Ups

3. $h(x) = 5x - 2\sqrt{x}$	4. $y = \frac{7x^4 + 6x^3 - 5x^2 + 2x - 3}{x}$

Name _____ Date _____ Period _____

Lesson 10.5: Derivatives and The Power Rule **Warm-Up # 2**

1. Find the derivative for each of the following using the power rule. $f(x) = 8x^3 - 4x^2 + 2x + 6$	2. $g(x) = (3x - 4)(5x + 3)$
3. $h(x) = 6x - 3\sqrt{x}$	4. $y = \frac{8x^4 + 2x^3 + 4x^2 + x - 5}{x}$

Form A

_____

eriod _____

following

2. $g(x) = (3x - 4)(2x + 5)$

3. $h(x) = 4x - 3\sqrt{x}$

4. $y = \frac{5x^3+2x^2-4x+3}{x}$

Grade:

10.5 Derivatives & Power Rule **Form B**

Name _____

Date _____ Period _____

Find the derivative for each of the following using the power rule.

1. $f(x) = 2x^3 + 3x^2 - 4x + 5$

2. $g(x) = (4x - 5)(3x + 2)$

3. $h(x) = 7x - 5\sqrt{x}$

4. $y = \frac{6x^3-3x^2+5x-2}{x}$

Grade:

Daily Lesson Quiz