Non-AP Calculus 2.2-2.4 Derivatives Quiz Review WS #4

No negative exponents in answer.

1. Find $\frac{dy}{dx}$ if $y = 5x^3(\sqrt{x} - 1) - \frac{2x^2}{15} + 4\pi - 5\pi^3 x + \sqrt[5]{x^2} + \frac{2}{\sqrt{x^9}}$

2. Find $\frac{dy}{dx}$ for $y = \sqrt[5]{3x^7 - 2x + 3\pi}$

3. Find g'(x) for $g(x) = x^2(x^4 - 7)^3$ (simplify fully in factored form)

4. Find $\frac{dy}{dx}$ for $y = \left(\frac{1+x^3}{2-x^2}\right)^7$ (simplify fully in factored form)

5. If $f(x) = \frac{2-x}{x^2-2}$ find $f'(x)$ (simplify fully). Then write the equation of the line tangent to $f(x)$ at $x = 1$ in point-slope form.

6) $Find\ \frac{dy}{dx}\ for\ f(x) = \frac{2x^3 - 7x}{1 - 5x^2}$

Power Rule:	$\frac{d}{dx}[x^n] = n * x^{n-1}$	**Point-slope form**	$y - y_1 = m(x - x_1)$
Product Rule:	$\frac{d}{dx}[f(x)g(x)] = f'g + fg'$	**Quotient Rule:**	$\frac{d}{dx}\left[\frac{f(x)}{g(x)}\right] = \frac{f'g - fg'}{g^2}$
Chain Rule:	$\frac{d}{dx} f[g(x)] = f'[g(x)] \times g'(x)$		

Non-AP Calculus 2.2-2.4 Derivatives Quiz Review WS #4

No negative exponents in answer.

Key

1. Find $\frac{dy}{dx}$ if $y = 5x^3(\sqrt{x} - 1) - \frac{2x^2}{15} + 4\pi - 5\pi^3 x + \sqrt[5]{x^2} + \frac{2}{\sqrt{x^9}}$

$y = 5x^3(x^{1/2} - 1)$

$y = 5x^{7/2} - 5x^3 - \frac{2}{15}x^2 + 4\pi - 5\pi^3 x + x^{2/5} + 2x^{-9/2}$

$y' = 5 \cdot \frac{7}{2}x^{5/2} - 15x^2 - \frac{2}{15} \cdot 2x + 0 - 5\pi^3 + \frac{2}{5}x^{-3/5} + 2 \cdot -\frac{9}{2}x^{-11/2}$

$\boxed{y' = \frac{35}{2}x^{5/2} - 15x^2 - \frac{4}{15}x - 5\pi^3 + \frac{2}{5x^{3/5}} - \frac{9}{x^{11/2}}}$

2. Find $\frac{dy}{dx}$ for $y = \sqrt[5]{3x^7 - 2x + 3\pi}$

*chain rule $y = (3x^7 - 2x + 3\pi)^{1/5}$

outside: $(\ )^{1/5}$

inside: $3x^7 - 2x + 3\pi$

$y' = \frac{1}{5}(\quad)^{-4/5} \cdot (21x^6 - 2)$

$y' = \frac{1}{5}(3x^7 - 2x + 3\pi)^{-4/5}(21x^6 - 2)$

$\boxed{y' = \frac{21x^6 - 2}{5(3x^7 - 2x + 3\pi)^{4/5}}}$

3. Find g'(x) for $g(x) = \underbrace{x^2}_{f}\underbrace{(x^4 - 7)^3}_{g}$ (simplify fully in factored form)

* product rule: $f'g + fg'$

* chain rule: outside: $(\ )^3$

inside: $x^4 - 7$

$g'(x) = \underbrace{2x}_{f'} \cdot \underbrace{(x^4 - 7)^3}_{g} + \underbrace{x^2}_{f} \cdot \underbrace{3(x^4 - 7)^2 \cdot (4x^3)}_{g'}$

$g'(x) = 2x(x^4 - 7)^3 + 12x^5(x^4 - 7)^2$

$g'(x) = 2x(x^4 - 7)^2[x^4 - 7 + 6x^4]$

$\boxed{g'(x) = 2x(x^4 - 7)^2(7x^4 - 7)}$

4. Find $\frac{dy}{dx}$ for $y = \left(\frac{1+x^3}{2-x^2}\right)^7$ (simplify fully in factored form)

*chain rule:

outside: $(\ )^7$

inside: $\frac{1+x^3}{2-x^2}$

$\frac{dy}{dx} = 7\left(\frac{1+x^3}{2-x^2}\right)^6 \cdot \left[\frac{\overbrace{3x^2}^{f'} \cdot \overbrace{(2-x^2)}^{g} - \overbrace{(1+x^3)}^{f}\overbrace{(-2x)}^{g'}}{\underbrace{(2-x^2)^2}_{g^2}}\right] \rightarrow \frac{6x^2 - 3x^4 + 2x + 2x^4}{(2-x^2)^2}$

$\boxed{\frac{dy}{dx} = \frac{7(1+x^3)^6(-1x^4 + 6x^2 + 2x)}{(2-x^2)^8}}$

5. If $f(x)=\frac{2-x}{x^2-2}$ find $f'(x)$ (simplify fully). Then write the equation of the line tangent to $f(x)$ at $x=1$ in point-slope form.

*quotient rule

$$f'(x)=\frac{\overbrace{(-1)}^{f'}\overbrace{(x^2-2)}^{g}-\overbrace{(2-x)}^{f}\overbrace{(2x)}^{g'}}{\underbrace{(x^2-2)^2}_{g^2}}$$

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

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

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

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

$$f(1)=-1$$

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

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

point: $(1,-1)$

slope: $m=-1$

$$y-y_1=m(x-x_1)$$

$$y-(-1)=-1(x-1)$$

$$\boxed{y+1=-1(x-1)}$$

6) Find $\frac{dy}{dx}$ for $f(x)=\frac{2x^3-7x}{1-5x^2}$

$$f'(x)=\frac{\overbrace{(6x^2-7)}^{f'}\overbrace{(1-5x^2)}^{g}-\overbrace{(2x^3-7x)}^{f}\overbrace{(-10x)}^{g'}}{\underbrace{(1-5x^2)^2}_{g^2}}$$

$$f'(x)=\frac{6x^2-30x^4-7+35x^2+20x^4-70x^2}{(1-5x^2)^2}$$

$$\boxed{f'(x)=\frac{-10x^4-29x^2-7}{(1-5x^2)^2}}$$

Power Rule:	$\frac{d}{dx}[x^n]=n*x^{n-1}$	Point-slope form	$y-y_1=m(x-x_1)$
Product Rule:	$\frac{d}{dx}[f(x)g(x)]=f'g+fg'$	Quotient Rule:	$\frac{d}{dx}\left[\frac{f(x)}{g(x)}\right]=\frac{f'g-fg'}{g^2}$
Chain Rule:	$\frac{d}{dx}f[g(x)]=f'[g(x)]\times g'(x)$		