10350 Tutorial Week 01 - Set 01 Name ______________________________

Section ___________________

1. Let $f(x) = \dfrac{1}{x}$. Assuming that $h \neq 0$, find and simplify $\dfrac{f(x+h)-f(x)}{h}$.

$$
\begin{aligned}
\frac{f(x+h)-f(x)}{h} &= \frac{\dfrac{1}{x+h} - \dfrac{1}{x}}{h} \\
&= \frac{1}{h}\left(\frac{x}{x(x+h)} - \frac{x+h}{x(x+h)}\right) \\
&= \frac{1}{h}\left(\frac{-h}{x^2+xh}\right) \\
&= \frac{-1}{x^2+xh} \text{ (accepted solution)} \\
&= \frac{-1}{x(x+h)} \text{ (accepted solution)}
\end{aligned}
$$

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2. Simplify the following expression as far as possible. Your answer should have no negative exponents:

(a)

$$\frac{y^4(x^3y^{-2})^2}{2x^{-1}} = \frac{1}{2}(y^4x^6y^{-4}x^1) = \frac{x^7}{2}$$

(b)

$$\begin{aligned}\frac{(x^2+4)^2(3) - 2x(x^2+4)(3x-5)}{(x^2+4)^4} &= \frac{3(x^2+4) - 2x(3x-5)}{(x^2+4)^3} \\ &= \frac{3x^2+12-6x^2+10x}{(x^2+4)^3} \\ &= \frac{-3x^2+10x+12}{(x^2+4)^3}\end{aligned}$$

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3. Find ALL the zeroes of $f(x) = 2x^2 - x - 3$ **exactly**.

$f(x) = 2x^2 - x - 3 = (2x-3)(x+1) \implies f(x) = 0$ when $x = \dfrac{3}{2}, -1$

4. Solve $4^{x-2} = 8$. Be sure your answer is simplified.

$$\begin{aligned} 4^{x-2} &= 8 \\ (2^2)^{(x-2)} &= 2^3 \\ 2^{2x-4} &= 2^3 \\ 2x - 4 &= 3 \\ 2x &= 7 \\ x &= \frac{7}{2} \end{aligned}$$

5. Find and simplify the expression $\dfrac{g(n+1)}{g(n)}$ if $g(n) = \dfrac{2^n x^{2n-1}}{n^3}$.

$$\begin{aligned} \frac{g(n+1)}{g(n)} &= \frac{\dfrac{2^{n+1}x^{2(n+1)-1}}{(n+1)^3}}{\dfrac{2^n x^{2n-1}}{n^3}} \\ &= \left(\frac{2^{n+1}x^{2(n+1)-1}}{(n+1)^3}\right)\left(\frac{n^3}{2^n x^{2n-1}}\right) \\ &= \frac{2^{n+1}x^{2n+2-1}n^3}{(n+1)^3 2^n x^{2n-1}} \\ &= \frac{2^{(n+1)-n}x^{2n+1-(2n-1)}n^3}{(n+1)^3} \\ &= \frac{2x^2n^3}{(n+1)^3} \end{aligned}$$