Math 121 S09N01 - Quiz 1 Name: SOLUTIONS.
Jan 16 2009 Stu#:

(1) [5 points] Let $f(x) = \frac{1}{x}$. Find and simplify $\frac{f(x) - f(a)}{x - a}$.

$$\frac{f(x) - f(a)}{x-a}$$

$$= \frac{\frac{1}{x} - \frac{1}{a}}{x-a}$$

$$= \frac{\frac{a-x}{ax}}{x-a}$$

$$= \frac{-\cancel{(x-a)}}{ax} \cdot \frac{1}{\cancel{(x-a)}}$$

$$= \frac{-1}{ax}$$

(2) [5 points] Let $f(x) = x + \frac{1}{x}$ and $g(x) = \frac{x+1}{x+2}$. Find $(f \circ g)(x)$ and state the domain.

$$(f \circ g)(x) = f(g(x))$$

$$= \left.\frac{x+1}{x+2} + \frac{1}{\left(\frac{x+1}{x+2}\right)}\right\} *$$

$$= \frac{x+1}{x+2} + \frac{x+2}{x+1}$$

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

$$= \frac{2x^2+6x+5}{(x+1)(x+2)}$$

Using $*$, must have

$x+2 \neq 0$, $\frac{x+1}{x+2} \neq 0$

$\therefore x \neq -2$, $x \neq -1$

$\therefore$ domain of $f \circ g$ is $\{x \mid x \neq -2, x \neq -1\}$

<u>or</u>

$(-\infty,-2) \cup (-2,-1) \cup (-1,\infty)$.

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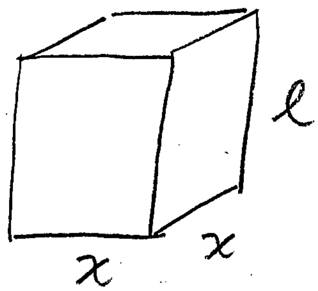
(3) [**5 points**] An open rectangular box with volume 2 m^3 has a square base of side length x. Express the surface area of the box as a function of the length of a side of the base.



$$V = x^2 l = 2$$

$$\therefore \ l = \frac{2}{x^2}$$

$$S = 4xl + x^2$$

$$= 4x\left(\frac{2}{x^2}\right) + x^2$$

$$= \frac{8}{x} + x^2$$

$$\therefore \ S(x) = \frac{8}{x} + x^2, \quad x > 0$$