

Lab 1

1 a) Incorrect: $\frac{x^2 + (-1)}{x+1} \neq \frac{x^2}{x} + \frac{-1}{1}$ (can't split up sum in denominator)

$$\frac{x^2 - 1}{x+1} = \frac{\cancel{(x+1)}(x-1)}{\cancel{x+1}} \quad \text{if } x \neq -1$$

b) Incorrect: $(x+y)^2 = x^2 + 2xy + y^2$ $(x-y)^2 = x^2 - 2xy + y^2$
 $\neq x^2 + y^2$ $\neq x^2 - y^2$

$$(x+1)^2 + (x-7)^2 = x^2 + 2xy + y^2 - (x^2 - 2xy + y^2) \\ = 4xy$$

c) Correct, if $x \neq 4$

d) Incorrect: $\frac{x^2 y^5}{2x^{-3}} = \frac{1}{2} x^2 y^5 x^3 = \frac{1}{2} x^5 y^5$

e) Incorrect: $\frac{(2x)^2 - 17x + 9}{2x} = \frac{(2x)^2}{2x} - \frac{17x}{2x} + \frac{9}{2x} = 2x - \frac{17}{2} + \frac{9}{2}x^{-1}$

f) Incorrect: $x^{-1} + y^{-1} \neq (x+y)^{-1}$

$$\frac{x^{-1} + y^{-1}}{x^{-1} - y^{-1}} = \frac{\frac{1}{x} + \frac{1}{y}}{\frac{1}{x} - \frac{1}{y}} = \frac{\frac{y+x}{xy}}{\frac{y-x}{xy}} = \frac{y+x}{y-x} \cdot \frac{xy}{y-x} \\ = \frac{y+x}{y-x}$$

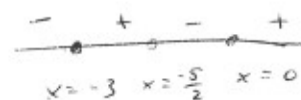
2 a) Domain: $(-\infty, \infty)$

b) $2x + 10 \neq 0 \Rightarrow x \neq -5$ or $(-\infty, -5) \cup (-5, \infty)$

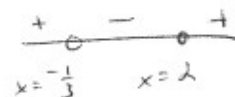
c) $2x + 10 \geq 0 \Rightarrow 2x \geq -10 \Rightarrow x \geq -5$ or $[-5, \infty)$

d) $2x + 10 > 0 \Rightarrow x > -5$ or $(-5, \infty)$

e) $x(x+3)(2x+5) \geq 0 \Rightarrow [-3, -\frac{5}{2}] \cup [0, \infty)$



f) $\frac{x-2}{3x+1} > 0 \Rightarrow (-\infty, -\frac{1}{3}) \cup [2, \infty)$



$$3) \quad a) \quad g(x) = x^2 + 5x - 2$$

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

$$b) \quad g(x) = x^2 + 9$$

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

$$4) \quad f(x) = x^2 + 3$$

$$a) \quad f(2) = 2^2 + 3 = 7$$

$$b) \quad f(a) = a^2 + 3$$

$$c) \quad f(x+h) = (x+h)^2 + 3 = x^2 + 2xh + h^2 + 3$$

$$d) \quad f(x+h) - f(x) = (x^2 + 2xh + h^2 + 3) - (x^2 + 3)$$

$$= 2xh + h^2$$

$$= h(2x+h)$$

$$e) \quad \frac{f(x+h) - f(x)}{h} = \frac{h(2x+h)}{h}$$

$$= 2x+h \quad (\text{if } h \neq 0)$$