Calculus I, 21-111, HW #1 Solutions

Section 0.1

#28) No, it is not a function since it fails the vertical line test

#48) $f(-2) = (-2)(5+(-2))(4-(-2))$

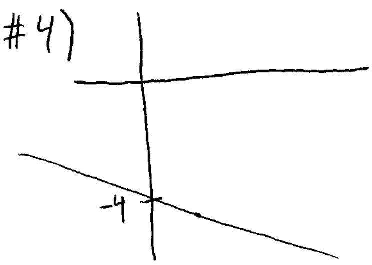
$$= (-2)(3)(6)$$

$$= -36$$

So $(-2,-36)$ is on the graph, but $(-2,12)$ is not.

Section 0.2

#4)



The graph of $f(x) = -\frac{1}{2}x - 4$ is a line with slope $\frac{-1}{2}$ passing throug the point $(0,-4)$.

#16) Let x = amount of natural gas extracted (in thousands of cubic feet).

~~Let~~ $f(x)$ = money landowner makes as a function of x.

Then $f(x) = \$5000 + .1x$

Section 0.3

#31) $f(x+h) - f(x) = (x+h)^2 - x^2$

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

$$= x^2 + 2xh + h^2 - x^2$$

$$= 2xh + h^2$$

#37) $h(x) = f(g(x))$ converts from British sizes to U.S. sizes

$$h(x) = f(g(x)) = f(8x+1)$$
$$= \frac{1}{8}(8x+1)$$
$$= x + \frac{1}{8}$$

Section 0.4

#8) $x^2 - 4x + 5 = 0 \implies x = \frac{4 \pm \sqrt{16 - 4 \cdot 1 \cdot 5}}{2 \cdot 1}$

$$= \frac{4 \pm \sqrt{16-20}}{2}$$
$$= \frac{4 \pm \sqrt{-4}}{2}$$

Since $\sqrt{-4}$ not real, $\boxed{\text{No real solutions}}$

#16) $x^2 - 1 = (x+1)(x-1)$

#34) $x + \frac{2}{x-6} = 3 \implies x(x-6) + 2 = 3(x-6)$ (multiply both sides by $(x-6)$)

$$\implies x^2 - 6x + 2 = 3x - 18$$
$$\implies x^2 - 9x + 20 = 0$$
$$\implies (x-4)(x-5) = 0$$
$$\implies \boxed{x = 4 \text{ or } 5}$$

Section 0.5

#20) $(27)^{2/3} = (27^{1/3})^2 = 3^2 = 9$

#34) $\frac{3^{5/2}}{3^{1/2}} = 3^{5/2 - 1/2} = 3^{4/2} = 3^2 = 9$

Section 1.1

#10) Use point-slope form:

$$y-(-1) = \frac{7}{3}(x-5)$$

$$\boxed{y+1 = \frac{7}{3}(x-5)}$$

#14) First compute the slope: $\frac{2-0}{1-(-\frac{1}{2})} = \frac{2}{3/2} = \frac{4}{3}$

Now use point-slope form with (1,2):

$$\boxed{y-2 = \frac{4}{3}(x-1)}$$

#20) Horizontal lines have a slope of 0 (they're constant functions)

so the equation is $\boxed{y=\sqrt{2}}$