Math 111 Quiz #7 Solutions

1. Transformations of $g(x)$ to obtain $-4g(\frac{1}{3}x)$: Horizontal stretch by 3 (Multiply x-values by 3), Vertical stretch by 4 (Multiply y-values by 4), reflection over the x-axis (Multiply y-values by -1)

   So, the domain of $-4g(\frac{1}{3}x)$ is $\boxed{-3 \leq x \leq 21}$ as a result of the horizontal stretch.
   The range of $-4g(\frac{1}{3}x)$ is $\boxed{-12 \leq y \leq 8}$ as a result of the vertical stretch and reflection.

2. Since the vertex is $(-2, 1)$, the equation is $y = a(x+2)^2 + 1$.

   Plugging in $x = 0$ & $y = 6$: $\quad 6 = a(0+2)^2 + 1 \quad \Rightarrow \quad a = \frac{5}{4}$

   $$\Rightarrow \quad \boxed{y = \frac{5}{4}(x+2)^2 + 1}$$

3. (a) Using the vertex formula, the maximum height occurs when $t = \frac{-b}{2a} = \frac{-32}{2(-16)} = 1$ second.

   So, the maximum height is $h(1) = -16(1)^2 + 32(1) = \boxed{16 \text{ feet.}}$

   (b) The rocket lands when $h(t) = 0$. You can either solve $-16t^2 + 32t = 0$ or you can note that since the height is 0 at $t = 0$ and the vertex occurs when $t = 1$, by symmetry, you have that the rocket will land at $\boxed{2 \text{ seconds.}}$

4. Here are some possibilities:

   - $\boxed{u(x) = \ln(x) \qquad v(x) = 5 - x^2}$
   - $\boxed{u(x) = \ln(5 - x) \qquad v(x) = x^2}$