1. Let $f(x) = (4x^2 - 6x + 3)^3$. Compute $f'(x)$.

$$f'(x) = 20 \left( 4x^2 - 6x + 3 \right)^2 \left( 8x - 6 \right)$$

2. Let $h(t) = (2t^3 + 5t)^{\frac{t^2 - 1}{t+1}}$. Compute $h'(t)$.

$$h'(t) = \left( 6t^2 + 5 \right) \left( \frac{t^2 - 1}{t+1} \right)' + \left( 2t^3 + 5t \right) \left[ \frac{t+1}{(t+1)^2} \right] \left( \frac{(t+1)(2t) - (t^2 - 1) \cdot 1}{(t+1)^2} \right)$$

3. A projectile is fired vertically from the ground. At time $t$, the position $s(t)$ of the projectile is given by $s(t) = 4t^3 + 16t^2 - 16t^2$. Recall that the velocity is the first derivative of the position, and that acceleration is the second derivative of the position.

(a) Find the velocity $v(t)$ of the projectile at time $t = 3$.

$$v(t) = s'(t) = 16t^3 + 48t^2 - 32t$$

At $t = 3$,

$$s_0, v(3) = 16 \cdot 3^3 + 48 \cdot 3^2 - 32 \cdot 3 = 768$$

(b) Find the acceleration $a(t)$ of the projectile at time $t = 3$.

$$a(t) = v'(t) = s''(t) = 48t^2 + 96t - 32$$

At $t = 3$,

$$s_0, a(3) = 688$$
1. Let \( f(x) = (5x^3 - 3x + 5)^{10} \). Compute \( f'(x) \).

\[
f'(x) = 10 (5x^3 - 3x + 5)^9 (15x^2 - 3)
\]

2. Let \( h(t) = (4t^3 + 2t)(\frac{t^2+1}{t-1}) \). Compute \( h'(t) \).

\[
h'(t) = \left( 12t^2 + 2 \right) \left( \frac{t^2+1}{t-1} \right) + \left( 4t^3 + 2t \right) \left( \frac{(t-1)(2t) - (t^2+1) \cdot 1}{(t-1)^2} \right)
\]

3. A projectile is fired vertically from the ground. At time \( t \), the position \( s(t) \) of the projectile is given by \( s(t) = 3t^4 + 12t^3 - 16t^2 \). Recall that the velocity is the first derivative of the position, and that acceleration is the second derivative of the position.

(a). Find the velocity \( v(t) \) of the projectile at time \( t = 3 \).

\[
v(t) = s'(t) = 12t^3 + 36t^2 - 32t.
\]

So, \( v(3) = 552 \)

(b). Find the acceleration \( a(t) \) of the projectile at time \( t = 3 \).

\[
a(t) = v'(t) = s''(t) = 36t^2 + 72t - 32.
\]

So, \( a(3) = 36 \cdot 3^2 + 72 \cdot 3 - 32 = 508 \)