1. Given \( f(x) = 4x^2 \), find the following and simplify.

(a). \( f(x + h) \)

\[
4(x + h)^2 = 4(x^2 + 2hx + h^2) = 4x^2 + 8hx + 4h^2
\]

(b). \( f(x + h) - f(x) \)

\[
4x^2 + 8hx + 4h^2 - 4x^2 = 8hx + 4h^2
\]

(c). \( \frac{f(x + h) - f(x)}{h} \)

\[
\frac{8hx + 4h^2}{h} = 8x + 4h
\]

(d). If you let \( h = 0 \), what do you get from your answer to part (c)?

\( 8x \)

2. Given \( f(x) = 2x^2 - x \), find the following and simplify.

(a). \( f(x + h) \)

\[
2(x + h)^2 - (x + h) = 2(x^2 + 2hx + h^2) - x - h = 2x^2 + 4hx + 2h^2 - x - h
\]

(b). \( f(x + h) - f(x) \)

\[
2x^2 + 4hx + 2h^2 - x - h - (2x^2 - x) = 4hx + 2h^2 - h
\]

(c). \( \frac{f(x + h) - f(x)}{h} \)

\[
\frac{4hx + 2h^2 - h}{h} = 4x + 2h - 1
\]

(d). If you let \( h = 0 \), what do you get from your answer to part (c)?

\( 4x - 1 \)

3. Given \( f(x) = 9 - \frac{1}{2}x^2 \), find the following and simplify.

(a). \( f(x + h) \)

\[
9 - \frac{1}{2}(x + h)^2 = 9 - \frac{1}{2}x^2 - hx - \frac{1}{2}h^2
\]

(b). \( f(x + h) - f(x) \)

\[
9 - \frac{1}{2}x^2 - hx - \frac{1}{2}h^2 - \left(9 - \frac{1}{2}x^2\right) = -hx - \frac{1}{2}h^2
\]

(c). \( \frac{f(x + h) - f(x)}{h} \)

\[
\frac{-hx - \frac{1}{2}h^2}{h} = -x - \frac{1}{2}h
\]

(d). If you let \( h = 0 \), what do you get from your answer to part (c)?

\( -x \)