3.1.11 First, $f(2) = (2)^2 + 1 = 5$, so this is *not* a trick question.

Now,

$$f(2+h) = (2+h)^2 + 1 = 5 + 4h + h^2,$$

so

$$f(2+h) - f(2) = (5 + 4h + h^2) - (5) = 4h + h^2;$$

then

$$\frac{f(2+h) - f(2)}{h} = \frac{4h + h^2}{h} = 4 + h,$$

so

$$\lim_{h \to 0} \frac{f(2+h) - f(2)}{h} = \lim_{h \to 0} (4 + h) = 4 + (0) = 4.$$

Thus, $f'(2) = 4$.

The line with slope 4 through $(2, 5)$ has equation

$$y = 4(x - 2) + 5$$

in (x, y), or

$$y = 4x - 3.$$

3.2.1 First,

$$f(c+h) = 4 - (c+h)^2 = 4 - c^2 - 2hc - h^2,$$

so

$$f(c+h) - f(c) = (4 - c^2 - 2hc - h^2) - (4 - c^2) = -2hc - h^2;$$

then

$$\frac{f(c+h) - f(c)}{h} = \frac{-2hc - h^2}{h} = -2c - h,$$

so

$$f'(c) = \lim_{h \to 0} \frac{f(c+h) - f(c)}{h} = \lim_{h \to 0} (-2c - h) = -2c - (0) = -2c.$$

Therefore,

$$f'(-3) = -2(-3) = 6,$$
$$f'(0) = -2(0) = 0,$$
$$f'(1) = -2(1) = -2.$$