Pre-Calculus Worksheet C1.2

Note: The completion of this worksheet requires you to know $(x+h)^3 = x^3 + 3x^2h + 3xh^2 + h^3$. This will NOT be given on any assessment. (Hint: Memorize it ☺)

For problems 1-3, find $\frac{dy}{dx}$ using the limit definition of the first derivative.

1. $y = x^2 + 4$
2. $y = x^2 - 2x + 2$
3. $y = x^3$

For problems 4-6, find $f'(x)$ using the limit definition of the first derivative.

4. $f(x) = 4x^2$
5. $f(x) = 3x^3 - 4$
6. $f(x) = x^2 - 3x$

For problems 7-12, find the equation of the line tangent to the curve at the given point. Leave your answer in point-slope form.

7. $f(x) = x^2 - 3x$ at $x = 1$
8. $g(x) = 3 - x^2$ at $x = 2$
9. $h(x) = 4x^2 + 5x + 2$ at $x = -1$
10. $f(x) = 2 - 3x - x^2$ at $x = 2$
11. $g(x) = x^2 - 4$ at $x = 0$
12. $h(x) = -2x^2$ at $x = 2$

For problems 13-18, identify f(x). You need NOT evaluate the given limit.

13. $\lim_{h\to 0} \frac{\left[(x+h)^2 - 2(x+h) + 3\right] - \left[x^2 - 2x + 3\right]}{h}$
14. $\lim_{a\to 0} \frac{\left[(x+a)^3 - (x+a)\right] - \left[x^3 - x\right]}{a}$
15. $\lim_{h\to 0} \frac{\ln(2(x+h)+3) - \ln(2x+3)}{h}$
16. $\lim_{b\to 0} \frac{\sin(x+b) - \sin x}{b}$
17. $\lim_{h\to 0} \frac{\frac{1}{x+h+1} - \frac{1}{x+1}}{h}$
18. $\lim_{c\to 0} \frac{\cos(2x+2c) - \cos 2x}{c}$