FIND $\frac{f(x)-f(1)}{x-1}$ $x \neq 1$

1) $f(x) = 3x$

$\frac{3x-3}{x-1}$

$\frac{3(x-1)}{x-1}$

$= 3$

2) $f(x) = -2x$

$\frac{-2x-(-2)}{x-1}$

$\frac{-2x+2}{x-1}$

$\frac{-2(x-1)}{x-1}$

$= -2$

3) $f(x) = 1-3x$

$\frac{1-3x-(-2)}{x-1}$

$\frac{-3x+3}{x-1}$

$\frac{-3(x-1)}{x-1}$

$= -3$

4) $f(x) = x^2+1$

$\frac{x^2+1-(2)}{x-1}$

$\frac{x^2-1}{x-1}$

$\frac{(x+1)(x-1)}{x-1}$

$= x+1$

5) $f(x) = 3x^2-2x$

$\frac{3x^2-2x-(1)}{x-1}$

$\frac{(3x+1)(x-1)}{x-1}$

$3x+1$

6) $f(x) = 4x-2x^2$

$\frac{4x-2x^2-2}{x-1}$

$\frac{-2(x^2-2x+1)}{x-1}$

$\frac{-2(x-1)(x-1)}{x-1}$

$= -2x+2$

7) $f(x) = x^3-x$

$\frac{x^3-x-0}{x-1}$

$\frac{x(x+1)(x-1)}{x-1}$

$= x^2+x$

8) $f(x) = x^2+x$

$\frac{x^2+x-2}{x-1}$

$\frac{(x-1)(x+2)}{x-1}$

$= x^2+2$

9) $f(x) = \frac{2}{x+1}$

$\frac{\frac{2}{x+1}-\frac{x+1}{x+1}}{x-1}$

$\frac{\frac{-x+1}{x+1}}{x-1} = \frac{-(x-1)}{x+1} \cdot \frac{1}{x-1} = \frac{-1}{x+1}$

10) $f(x) = \frac{1}{x^2}$

$\frac{\frac{1}{x^2}-\frac{x^2}{x^2}}{x-1}$

$\frac{\frac{1-x^2}{x^2}}{x-1}$

$\frac{(1+x)(1-x)}{x^2} \cdot \frac{1}{-1(1-x)}$

$-\frac{1+x}{x^2}$

11) $f(x) = \sqrt{x}$

$\frac{\sqrt{x}-1}{x-1}$

12) $f(x) = \sqrt{x+3}$

$\frac{\sqrt{x+3}-2}{x-1}$

$$\frac{[f(a+h)-f(a)]}{h}$$

13) $f(x) = -6x + 1$

$\frac{-6(a+h)+1-(-6a+1)}{h}$

$\frac{-6a-6h+1+6a-1}{h}$

$\frac{-6h}{h}$

$= -6$

14) $f(x) = 12x - 9$

$\frac{12(a+h)-9-(12a-9)}{h}$

$\frac{12a+12h-9-12a+9}{h}$

$\frac{12h}{h}$

$= 12$

15) $f(x) = 2x^2+4$

$2(a+h)^2+4-(2a^2+4)/h$

$2a^2+4ah+2h^2+4-2a^2-4/h$

$h(4a+2h)/h$

$= 4a+2h$

16) $f(x) = 3x^2-7$

$3(a+h)^2-7-(3a^2-7)/h$

$3a^2+6ah+3h^2-7-3a^2+7/h$

$6ah+3h^2/h$

$= 6a+3h$

17) $f(x) = 3x^2-x+4$

$3(a+h)^2-(a+h)+4-(3a^2-a+4)/h$

$3a^2+6ah+3h^2-a-h+4-3a^2+a-4/h$

$= 6a+3h-1$

18) $f(x) = 4x^2+2x-7$

$4(a+h)^2+2(a+h)-7-(4a^2+2a-7)/h$

$4a^2+8ah+4h^2+2a+2h-7-4a^2-2a+7/h$

$= 8a+4h+2$

19) $f(x) = -x^2-4x+6$

$-(a+h)^2-4(a+h)+6-(-a^2-4a+6)/h$

$-a^2-2ah-h^2-4a-4h+6+a^2+4a-6/h$

$-2a-h-4$

20) $f(x) = -2x^2+3x+10$

$-2(a+h)^2+3(a+h)+10-(-2a^2+3a+10)/h$

$-2a^2-4ah-2h^2+3a+3h+10+2a^2-3a-10/h$

$= -4a-2h+3$

21) $f(x) = x^3$

$(a+h)^3-a^3/h$

$a^3+3a^2h+3ah^2+h^3-a^3/h$

$= 3a^2+3ah+h^2$

22) $f(x) = 2x^3+4$

$2(a+h)^3+4-(2a^3+4)/h$

$2a^3+6a^2h+6ah^2+2h^3+4-2a^3-4/h$

$= 6a^2+6ah+2h^2$