2.1A pp. 101-104 (1-19 odds, omit 3)

1. A. 0
B. -3

5. $f(x) = 3-2x \quad (-1,5)$

$$\lim_{\Delta x\to 0} \frac{f(2+\Delta x)-f(2)}{\Delta x}$$
$$\lim_{\Delta x\to 0} \frac{3-2(2+\Delta x)-(3-2(2))}{\Delta x}$$
$$\lim_{\Delta x\to 0} \frac{3-4-2\Delta x-3+4}{\Delta x}$$
$$\lim_{\Delta x\to 0} \frac{-2\Delta x}{\Delta x}$$
$$\lim_{\Delta x\to 0} -2 = \boxed{-2}$$

7. $f(x) = x^2-4 \quad (1,-3)$

$$\lim_{\Delta x\to 0} \frac{f(1+\Delta x)-f(1)}{\Delta x}$$
$$\lim_{\Delta x\to 0} \frac{(1+\Delta x)^2-4-(1-4)}{\Delta x}$$
$$\lim_{\Delta x\to 0} \frac{1+2\Delta x+\Delta x^2-4-1+4}{\Delta x}$$
$$\lim_{\Delta x\to 0} \frac{2\Delta x+\Delta x^2}{\Delta x}$$
$$\lim_{\Delta x\to 0} 2+\Delta x = \boxed{2}$$

9. $f(t) = 3t-t^2 \quad (0,0)$

$$\lim_{\Delta x\to 0} \frac{f(0+\Delta x)-f(0)}{\Delta x}$$
$$\lim_{\Delta x\to 0} \frac{3\Delta x-\Delta x^2-0}{\Delta x}$$
$$\lim_{\Delta x\to 0} 3-\Delta x = \boxed{3}$$

11. $f(x) = 3$

$$f'(x) = \lim_{\Delta x\to 0} \frac{f(x+\Delta x)-f(x)}{\Delta x}$$
$$f'(x) = \lim_{\Delta x\to 0} \frac{3-3}{\Delta x}$$
$$f'(x) = \lim_{\Delta x\to 0} 0 = 0$$
$$\boxed{f'(x)=0}$$

B. $f(x) = -5x$

$$f'(x) = \lim_{\Delta x\to 0} \frac{f(x+\Delta x)-f(x)}{\Delta x}$$
$$f'(x) = \lim_{\Delta x\to 0} \frac{-5(x+\Delta x)-(-5x)}{\Delta x}$$
$$f'(x) = \lim_{\Delta x\to 0} \frac{-5x-5\Delta x+5x}{\Delta x}$$
$$f'(x) = \lim_{\Delta x\to 0} \frac{-5\Delta x}{\Delta x}$$
$$f'(x) = \lim_{\Delta x\to 0} -5 = -5$$
$$\boxed{f'(x)=-5}$$

15. $h(s) = 3 + \frac{2}{3}s$

$h'(s) = \lim_{\Delta s \to 0} \frac{f(s+\Delta s) - f(s)}{\Delta s}$

$h'(s) = \lim_{\Delta s \to 0} \frac{3 + \frac{2}{3}(s+\Delta s) - (3+\frac{2}{3}s)}{\Delta s}$

$h'(s) = \lim_{\Delta s \to 0} \frac{3 + \frac{2}{3}s + \frac{2}{3}\Delta s - 3 - \frac{2}{3}s}{\Delta s}$

$h'(s) = \lim_{\Delta s \to 0} \frac{2/3\,\Delta s}{\Delta s}$

$h'(s) = \lim_{\Delta s \to 0} 2/3 = \boxed{2/3}$

$\boxed{h'(s) = 2/3}$

17. $f(x) = 2x^2 + x - 1$

$f'(x) = \lim_{\Delta x \to 0} \frac{2(x+\Delta x)^2 + (x+\Delta x) - 1 - [2x^2 + x - 1]}{\Delta x}$

$f'(x) = \lim_{\Delta x \to 0} \frac{2(x^2 + 2x\Delta x + \Delta x^2) + x + \Delta x - 2x^2 - x + 1}{\Delta x}$

$f'(x) = \lim_{\Delta x \to 0} \frac{2x^2 + 4x\Delta x + 2\Delta x^2 + \Delta x - 2x^2 + 1}{\Delta x}$

$f'(x) = \lim_{\Delta x \to 0} \frac{4x\Delta x + 2\Delta x^2 + \Delta x + 1}{\Delta x}$

$f'(x) = \lim_{\Delta x \to 0} 4x + 2\Delta x + 1 = 4x + 1$

$\boxed{f'(x) = 4x + 1}$

19. $f(x) = x^3 - 12x$

$f'(x) = \lim_{\Delta x \to 0} \frac{(x+\Delta x)^3 - 12(x+\Delta x) - [x^3 - 12x]}{\Delta x}$

$f'(x) = \lim_{\Delta x \to 0} \frac{x^3 + 3x^2\Delta x + 3x\Delta x^2 + \Delta x^3 - 12x - 12\Delta x - x^3 + 12x}{\Delta x}$

$f'(x) = \lim_{\Delta x \to 0} \frac{3x^2\Delta x + 3x\Delta x^2 + \Delta x^3 - 12\Delta x}{\Delta x}$

$f'(x) = \lim_{\Delta x \to 0} 3x^2 + 3x\Delta x + \Delta x^2 - 12$

$\boxed{f'(x) = 3x^2 - 12}$