#1a $\lim_{x\to 2^-} f(x) = \lim_{x\to 2^-} (-x+1) = 3$

#1b $\lim_{x\to 2^+} f(x) = \lim_{x\to 2^+} (-x^2+10x-15) = 1$

#1c $\lim_{x\to 2} f(x)$ does not exist

#1d $\lim_{x\to 0^-} f(x) = \lim_{x\to 0^-} (x^3+1) = 1$

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

$\lim_{x\to 0} f(x) = 1$

#1e Continuous $\lim_{x\to 0} f(x) = 1 = f(0)$

#1f NOT continuous $\lim_{x\to 2} f(x)$ DNE

#2 $$\lim_{x\to 2} \frac{3x^2-4x-4}{2x^2-8}$$

$$= \lim_{x\to 2} \frac{(3x+2)\cancel{(x-2)}}{2(x+2)\cancel{(x-2)}}$$

$$= \frac{8}{8} = 1$$

#3 $$\lim_{x\to 0} \frac{\tan 6x}{\sin 2x}$$

$$= \lim_{x\to 0} \frac{\sin 6x}{1} \frac{1}{\cos 6x} \frac{1}{\sin 2x}$$

$$= \lim_{x\to 0} \cancel{\frac{\sin 6x}{6x}}^{1} \frac{6x}{1} \cancel{\frac{1}{\cos 6x}}^{1} \cancel{\frac{2x}{\sin 2x}}^{1} \frac{1}{2x}$$

$$= 3$$

#4 $$f'(x) = \lim_{h\to 0} \frac{f(x+h)-f(x)}{h}$$

$$= \lim_{h\to 0} \frac{[4(x+h)^2-7]-[4x^2-7]}{h}$$

$$= \lim_{h\to 0} \frac{\cancel{4x^2}+8xh+4h^2-\cancel{7}-\cancel{4x^2}+\cancel{7}}{h}$$

$$= \lim_{h\to 0} (8x+4h) = 8x$$

#5 $f(x) = x^{1/4} + x^{5/3}$

$f'(x) = \frac{1}{4}x^{-3/4} + \frac{5}{3}x^{2/3}$

#6 $f(x) = (x^{-1}+2)(x^{3/2}+1)$

product rule

$f'(x) = (x^{-1}+2)(\frac{3}{2}x^{1/2})$

$+ (x^{3/2}+1)(-x^{-2})$

#7 $f(x) = \dfrac{x^4+2x+1}{x+1}$

quotient rule

$f'(x) = \dfrac{(x+1)(x^4+2x+1)' - (x^4+2x+1)(x+1)'}{(x+1)^2}$

$= \dfrac{(x+1)(4x^3+2)-(x^4+2x+1)}{(x+1)^2}$

$$y = x^2 + 3x - 7$$

#8

slope of tangent line $= 4$

derivative $= 4$

$$2x + 3 = 4$$
$$2x = 1$$
$$x = 1/2$$

#9

$$y = 3x^2 - 5x$$
$$y' = 6x - 5$$

slope of tangent at $(2,2)$ is

$$6(2) - 5 = 7$$

tangent line $\quad y - 2 = 7(x - 2)$

#10

$$s = 80t - 16t^2$$
$$v = 80 - 32t$$

when $s = 96$ $\quad 80t - 16t^2 = 96$

$$16t^2 - 80t + 96 = 0$$
$$t^2 - 5t + 6 = 0$$
$$(t-2)(t-3) = 0$$

#10a At 96 feet on its way up

$t = 2$ $\quad v = 16$ f/s

#10b " on its way down

$t = 3$ $\quad v = -16$ f/s