1) Find the f'(x) by the limit process where $f(x) = \dfrac{1}{x-1}$

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

$$= \lim_{\Delta x \to 0} \frac{\frac{(x-1)}{(x+\Delta x-1)(x-1)} - \frac{1\,(x+\Delta x-1)}{(x-1)(x+\Delta x-1)}}{\Delta x}$$

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$$= \lim_{\Delta x \to 0} \frac{\frac{x-1-(x+\Delta x-1)}{(x-1)(x+\Delta x-1)}}{\Delta x} = \lim_{\Delta x \to 0} \frac{x-1-x-\Delta x+1}{\Delta x\,(x-1)(x+\Delta x-1)}$$

$$= \lim_{\Delta x \to 0} \frac{-\cancel{\Delta x}}{\cancel{\Delta x}\,(x-1)(x+\Delta x-1)} = \lim_{\Delta x \to 0} \frac{-1}{(x-1)(x+\Delta x-1)}$$

· Then by direct substitution $\boxed{= \dfrac{-1}{(x-1)^2}}$

2) Describe the x-values for which f(x) is differentiable:

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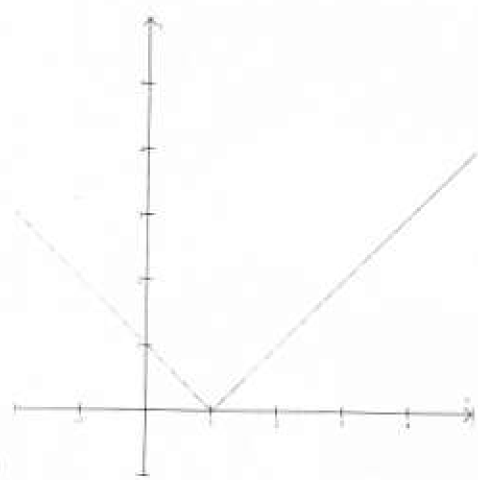

a)

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

differentiable $\{x \mid x \neq 1\}$

Pg. 122 text

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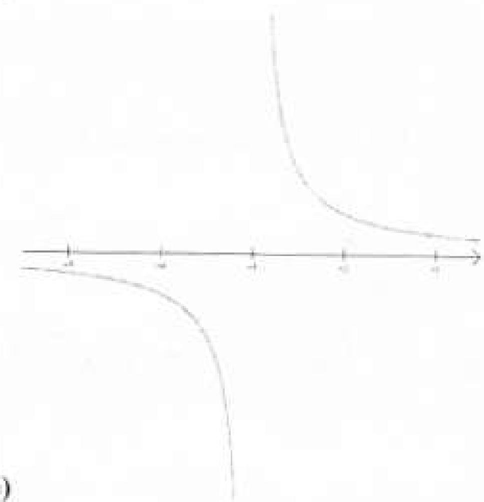

b)

$f(x) = \dfrac{1}{x+3}$

differentiable $\{x \mid x \neq -3\}$

Pg. 122 text

3) Using the basic differentiation rules find the derivative of each function:

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a) $f(x) = \sqrt[5]{x}$ $= x^{1/5}$

$f'(x) = 1/5\, x^{1/5-1} = \boxed{1/5\, x^{-4/5}}$

b) $g(t) = t^3 + 2e^t$

/3

$\boxed{g'(t) = 3t^2 + 2e^t}$

c) $g(t) = \pi \cos(t)$

/3

$g'(t) = \frac{d}{dt}[\pi \cos(t)] = \pi \frac{d}{dt}[\cos(t)] = \pi(-\sin t) = \boxed{-\pi \sin t}$

4) Using the basic differentiation rules find the slope of the graph of the function at the indicated point.

a) $f(\theta) = 4\sin(\theta) - \theta$ at the point (0,0)

slope $= f'(\theta) = 4\cos\theta - 1$

/5

slope at $(0,0) = f'(0) = 4\cos(0) - 1 = 4 - 1 = \boxed{3}$

b) $f(x) = \frac{3}{x^2}$ at the point (1,3)

rewrite $f(x) = 3x^{-2}$

slope $= f'(x) = -6x^{-3}$

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slope at $(1,3) = f'(1) = -6(1)^{-3} = \frac{-6}{1^3} = \boxed{-6}$