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

$$= \lim_{h\to 0} \frac{\sqrt{x+h-4} - \sqrt{x-4}}{h} \times \frac{\sqrt{x+h-4}+\sqrt{x-4}}{\sqrt{x+h-4}+\sqrt{x-4}}$$

$$= \lim_{h\to 0} \frac{\cancel{x}+\cancel{h}\cancel{-4} - \cancel{x}\cancel{+4}}{\cancel{h}(\sqrt{x+h-4}+\sqrt{x-4})}$$

$$= \frac{1}{2\sqrt{x-4}}$$

$$f'(6) = \frac{1}{2\sqrt{6-4}}$$

$$= \frac{1}{2\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}}$$

$$= \frac{\sqrt{2}}{4}$$

Solve for b in
$y = mx+b$; $m = \frac{\sqrt{2}}{4}$; $x=6$; $f(6) = \sqrt{6-4}$
$= \sqrt{2}$

$$\sqrt{2} = \frac{\sqrt{2}}{\underset{2}{\cancel{4}}}(\overset{3}{\cancel{6}}) + b$$

$$b = \sqrt{2} - \frac{3\sqrt{2}}{2}$$

$$= -\frac{\sqrt{2}}{2}$$

$\therefore$ The equation of the tangent at $x=6$ is $y = \frac{\sqrt{2}}{4}x - \frac{\sqrt{2}}{2}$.

2 a) $\lim_{x \to 6^-} f(x) = 3$ ONE-SIDED LIMIT

(b) $\lim_{x \to 6} f(x) = DNE$ because $\lim_{x \to 6^-} f(x) \neq \lim_{x \to 6^+} f(x)$

$(\because)$

(c) $\lim_{x \to 2} f(x) = -2$

(d) $\lim_{x \to -3^+} f(x) = \infty$ $\therefore$ The limit does not exist because the limit does not approach an actual value.

$\lim_{x \to -3^+} f(x) = DNE$ $\because \lim_{x \to -3^+} = +\infty$

L7 (2.2) The Power Rule

Notation used for the derivative of a function: $f'(x)$

y'	y prime
$\frac{dy}{dx}$	the differential of y with respect to the differential of x
$f'(x)$	f prime at x
$\frac{d}{dx}f(x)$	Leibniz notation the derivative of f(x) with respect to x

The Power Rule

If $f(x) = x^n$, then $f'(x) = nx^{n-1}$.

$3x^2$

In Leibniz notation:

$$\frac{d}{dx}x^n = nx^{n-1}$$

The Derivative of a Constant

If $f(x) = c$, then $f'(x) = 0$.

Ex1: Find the derivative of each function.

a) $y = \underline{3x^2} \underline{- 5x^1} \underline{+ 7}$

$y' = 6x^{2-1} - 5x^{1-1} + 0$

$y' = 6x - 5$

b) $y = \underline{x(x-4)(x+4)}$

$y = x(x^2 - 16)$

$= x^3 - 16x$

$\frac{dy}{dx} = 3x^2 - 16$

c) $y = \frac{5}{x^2}$

$y = 5x^{-2}$

$y' = -10x^{-3}$

$y' = \frac{-10}{x^3}$

d) $y = \sqrt{2x^3}$

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

$y = \sqrt{2}\, x^{\frac{3}{2}}$

$y' = \frac{3\sqrt{2}}{2} x^{\frac{3}{2} - \frac{2}{2}}$

$y' = \frac{3\sqrt{2}}{2} x^{\frac{1}{2}}$

$y' = \frac{3\sqrt{2}\sqrt{x}}{2}$

$y' = \frac{3\sqrt{2x}}{2}$

Ex2: Find the point on the curve $y = x^2 + 3x - 10$ where the slope of the tangent is equal to -1. Sketch this situation.

$y' = -1$

$y = x^2 + 3x - 10$

$y = (x+5)(x-2)$

$y' = 2x + 3$

Set equal to each other & solve for x.

$-1 = 2x + 3$

$x = -2$

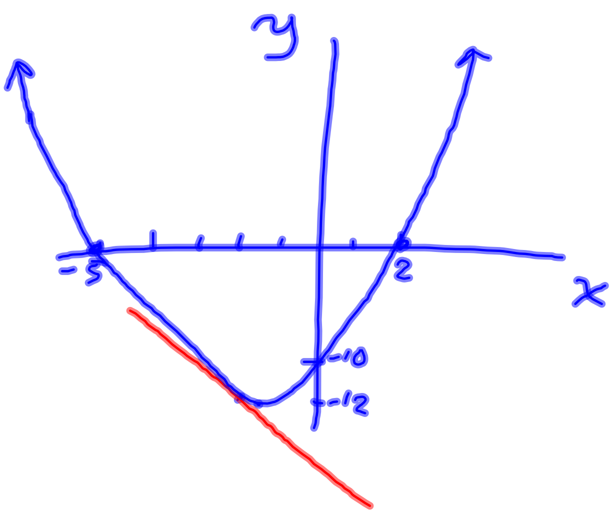
Sub $x = -2$ into $y = x^2 + 3x - 10$

$= (-2)^2 + 3(-2) - 10$

$= 4 - 6 - 10$

$= -12$

$\therefore$ The point is $(-2, -12)$.



Assigned Work:

p.82 # 2, 3def, 4cef, 8ab, 9bf, 14, 15, 16