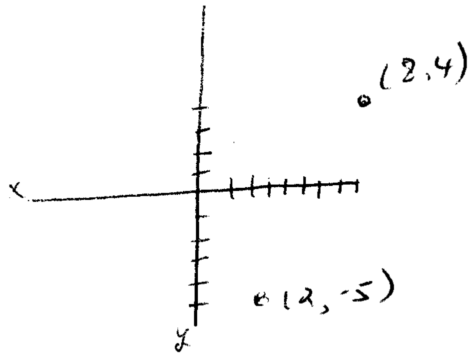
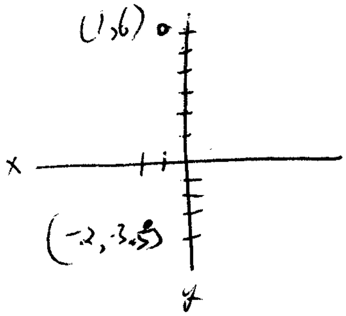
1) a)



distance $d = \sqrt{(8-2)^2 + (4--5)^2}$
$= \sqrt{6^2 \; 9^2} = \sqrt{117}$

midpoint $\left(\frac{8+2}{2}, \frac{4-5}{2}\right) = \left(5, -\frac{1}{2}\right)$

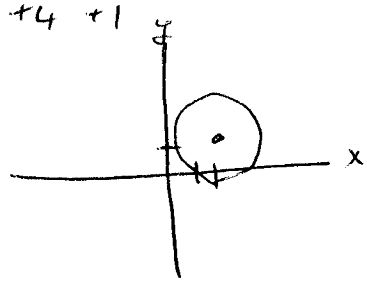
b)



$d = \sqrt{(1--2)^2 + (6--3.5)^2}$
$= \sqrt{(3)^2 + (9.5)^2} = \sqrt{\frac{415}{2}}$

midpoint $\left(\frac{1-2}{2}, \frac{6-3.5}{2}\right) = \left(\frac{-1}{2}, 1.25\right)$

2) $x^2 - 4x + 4 + y^2 - 2y + 1 = -3 + 4 + 1$
$(x-2)^2 + (y-1)^2 = 2$



center $(2,1)$
radius $\sqrt{2}$

3) a) $m = \frac{6-3}{-1-2} = \frac{3}{-3} = -1$ $\quad y - 3 = -1(x-2)$
$\Rightarrow \boxed{y = -x + 5}$

b) $y - 4 = 2(x-2) \Rightarrow \boxed{y = 2x}$

4) a) $\sqrt{2x-5} = f(x) \Rightarrow 2x - 5 \geq 0 \Rightarrow \boxed{x \geq \frac{5}{2}}$

b) $\ln(x+3) \Rightarrow x+3 > 0 \quad \boxed{x > -3}$

c) $\frac{x}{\sqrt{x+2}} \geq 0$ but $\neq 0 \Rightarrow x+2 > 0 \Rightarrow \boxed{x > -2}$

5) a) Note that $\sqrt{2x-5}$ as written is 1-1 since we assume it will be positive unless told otherwise.
$\Rightarrow y = \sqrt{2x-5} \Rightarrow x = \sqrt{2y-5} \Rightarrow \boxed{\frac{x^2+5}{2} = y}$

b) $\ln(x+3) = y \Rightarrow \ln(y+3) = x \Rightarrow$ take exponential of both,
$e^{\ln(y+3)} = e^x \Rightarrow y+3 = e^x \Rightarrow \boxed{y = e^x - 3}$

5) c) $\frac{x}{\sqrt{x+2}} = y$, $(1-1)$ check

$\frac{y}{\sqrt{y+2}} = x$

$\Rightarrow \quad x^2 = \frac{y^2}{y+2}$

$y^2 - x^2 y - 2x^2 = 0$

(here we should use the quadratic formula to solve for y...)

$$\boxed{y = \frac{x^2 \pm \sqrt{x^4 + 8x^2}}{2}}$$

6) a) polynomial, continuous everywhere

b) $f(x) = \frac{x-4}{x^2-5x-14} = \frac{x-4}{(x-7)(x+2)}$

cont. on $(-\infty,-2), (-2,7)$
$(7,+\infty)$

7) a) $f(x) = \frac{x-2}{x^2-4x+3} = \frac{x-2}{(x-3)(x-1)}$

V. asymptotes
as $x \to +3^+$, $f(x) \to +\infty$
$x \to +3^-$, $f(x) \to -\infty$
$x \to +1^+$, $f(x) \to +\infty$
$x \to +1^-$, $f(x) \to -\infty$

h. asymptotes.
as $x \to \pm\infty$, $f(x) \to 0$.

b) $g(x) = \frac{x^2-x-2}{x-2} = \frac{(x-1)\cancel{(x-2)}}{\cancel{x-2}}$, no vertical asymptotes.

as $x \to +\infty$, $f(x) \to +\infty$
$x \to -\infty$, $f(x) \to -\infty$ — no horiz asymptotes.

8) a) $f'(x) = \lim_{h\to 0} \frac{\sqrt{x-2+h} - \sqrt{x-2}}{h} \cdot \frac{\sqrt{x-2+h} + \sqrt{x-2}}{\sqrt{x-2+h} + \sqrt{x-2}} = \lim_{h\to 0} \frac{(x-2+h) - (x-2)}{h(\sqrt{x-2+h} + \sqrt{x-2})}$

$= \lim_{h\to 0} \frac{\cancel{h}}{\cancel{h}(\sqrt{x-2+h} + \sqrt{x-2})} = \lim_{h\to 0} \frac{1}{\sqrt{x-2+h} + \sqrt{x-2}} = \boxed{\frac{1}{2\sqrt{x-2}}}$

b) $y' = \lim_{h\to 0} \frac{\frac{3}{(x+h)^2} - \frac{3}{x^2}}{h} = \lim_{h\to 0} \frac{\frac{3x^2 - 3(x+h)^2}{(x+h)^2 x^2}}{h} = \lim_{h\to 0} \frac{3x^2 - 3x^2 - 6xh - 3h^2}{(x+h)^2 x^2} \cdot \frac{1}{h}$

$= \lim_{h\to 0} \frac{\cancel{h}(-6x-3h)}{(x+h)^2 x^2} \cdot \frac{1}{\cancel{h}} = \frac{-6x}{x^2 \cdot x^2} = \boxed{\frac{-6}{x^3}}$

9) a) $y' = 7x^{7-1} - 3\cdot 3x^{3-1} + 0 = \boxed{7x^6 - 9x^2}$

b) $f(x) = x^{7/3} - 5x^5 \Rightarrow f'(x) = \frac{7}{3}x^{7/3-1} - 5\cdot 5x^{5-1}$

$= \boxed{\frac{7}{3}x^{4/3} - 25x^4}$

10) $f(x) = 5x^2 - \frac{10}{x}$ at $(1, -5)$ rewrites as $f(x) = 5x^2 - 10x^{-1}$

$\Rightarrow f'(x) = 10x - \frac{10(-1)}{x^2} = \Rightarrow f'(x)$ at 1,

$f'(1) = 10 + 10 = 20$

$m = 20$,

$\Rightarrow y - -5 = 20(x-1) \Rightarrow \boxed{y = 20x - 25}$