C1 June 2005
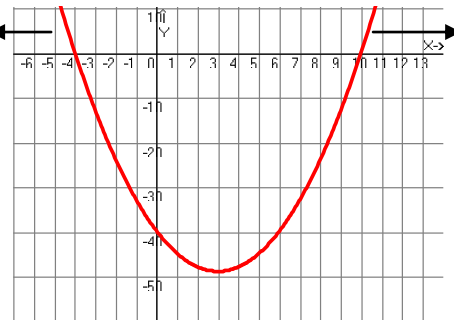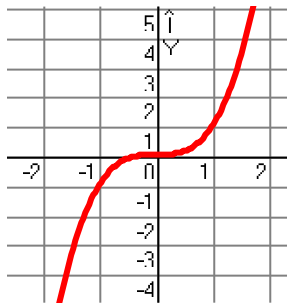
1) $(x+4)(x-10) \geq 0$ draw sketch with arrows out $x \leq -4$ $x \geq 10$

2) i) $3(x+2)^2 -5$
  ii) $x=-2$

3i) graph
 ii) x or y axis reflection
iii) $y=(x-p)^3$

4) subst $k = x^3$ $k^2+26k-27 =0$ solving $k = -27$ or 1
                                              $x^3 = -27$ or 1 $x = -3$ or 1

5a) $6x^{-1/3}$ add powers
 b) $4^{30} = (2^2)^{30} = 2^{60}$ Ans $2^{40} \times 2^{60} = 2^{100}$ add powers
 c) multiply top and bottom by $4+\sqrt{3}$ Ans $8 + 2\sqrt{3}$

6i) $y = 3x^3+2x^2 -5x-4$
 ii) $y` = 9x^2+4x-5$
 iii) $y`` = 18x+4$

7i) a) $b^2-4ac = 0$ b) $b^2-4ac = 52$ c) $b^2-4ac = -16$
  ii) a) fig3   b) fig 2   c) fig 5
     a) 1 root $x=-3$ b) 2 roots symmetry line $x=5$ c) no roots

8i) Circle centre $(0,0)$ rad $=5$
 ii) $y=5-2x$ subst in quadratic $5x^2-20x=0$ $x(5x-20) = 0$
                                          solving $x =0$ or 4 coords $(0,5)$ $(4,-3)$

9i) grad$=^4/_3$
 ii) perp grad $= -^3/_4$ use $y-y1 = m(x-x1)$ $4y+3x=11$
 iii) $P(-^5/_4,0)$ $Q(0,^{11}/_4)$ Mid pt $= (-^5/_8,^{11}/_8)$ Use formula
 iv) length $= ^{\sqrt{146}}/_4$ Use formula

10i) $y`=x^2-9$
  ii) $y` = 0$ solving $x=-3$ or $+3$ coords $(3,-18)$ $(-3,18)$
  iii) $y``=2x$    $x=3$ min  as $y``>0$ $x= -3$ max as $y``<0$
   iv) grad line$= -8$ so grad curve = grad line $x^2-9=-8$
       solving $x=1$ or -1
       for line $(1,-8^2/_3)$ $(-1,7^1/_3)$ for curve $(1,-8^2/_3)$ $(-1, 8^2/_3)$
       so $p=1$ $q= -8^2/_3$ if the line is a tangent