Exam Review: Quadratic Functions

1a) $\sqrt{5} \times \sqrt{10} = \sqrt{50}$

b) $\frac{\sqrt{40}}{\sqrt{2}} = \sqrt{20} = \sqrt{4}\sqrt{5} = 2\sqrt{5}$

c) $\frac{\sqrt{3} \times \sqrt{8}}{\sqrt{2}} = \frac{\sqrt{24}}{\sqrt{2}} = \sqrt{12} = \sqrt{4}\sqrt{3} = 2\sqrt{3}$

2a) $x^2 - 3x - 10 = 0$

$(x-5)(x+2) = 0$

$x = 5$ or $x = -2$

or

$x^2 - 3x - 10 = 0$

$x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$

$= \frac{3 \pm \sqrt{(-3)^2-4(1)(-10)}}{2(1)}$

$= \frac{3 \pm \sqrt{9+40}}{2}$

$= \frac{3 \pm \sqrt{49}}{2}$

$= \frac{3 \pm 7}{2}$

$x = 5, -2$

b) $4x^2 + 9 = 12x$

$4x^2 - 12x + 9 = 0$

$x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$

$= \frac{12 \pm \sqrt{(-12)^2-4(4)(9)}}{2(4)}$

$= \frac{12 \pm \sqrt{144-144}}{8}$

$= \frac{12 \pm \sqrt{0}}{8}$

$x = \frac{3}{2}$

Should have tried factoring first!!! It's faster :)

or

$4x^2 - 12x + 9 = 0$

$(2x-3)(2x-3) = 0$

$2x - 3 = 0$

$\frac{2x}{2} = \frac{3}{2}$

$x = \frac{3}{2}$

3a) $x^2 + 5x + 3 = 0$

discriminant → $D = b^2 - 4ac$

$= (5)^2 - 4(1)(3)$

$= 25 - 12$

$= 13$

$\therefore$ Two real roots

b) $2x^2 + x + 3 = 0$

$D = b^2 - 4ac$

$= 1^2 - 4(2)(3)$

$= 1 - 24$

$= -23$ ← negative

$\therefore$ No real roots

Note: { If $D < 0$ → no real roots
If $D = 0$ → one real root
If $D > 0$ → two real roots

4. Use factored form (since we have x-ints)

$y = a(x-r)(x-s)$

x-ints are 1 & 5 so...

$y = a(x-1)(x-5)$

but goes through (4,5) so... when $x=4$ then $y=5$

$5 = a(4-1)(4-5)$

$5 = a(3)(-1)$

$\frac{5}{-3} = \frac{-3a}{-3}$

$a = -\frac{5}{3}$

eq↑ → $y = -\frac{5}{3}(x-1)(x-5)$

5. Use vertex form (since we are given vertex)

$y = a(x-p)^2 + q$

The vertex is (2,-3) so... $p=2$ and $q=-3$ so...

$y = a(x-2)^2 - 3$

but it goes through (1,0) so... when $x=1$ then $y=0$

$0 = a(1-2)^2 - 3$

$0 = a - 3$

$3 = a$

$a = 3$

eq↑ → $y = 3(x-2)^2 - 3$

6. ① $y = 2x+3$

② $y = x^2 - 4x - 3$

Sub ① into ②

$x^2 - 4x - 3 = 2x + 3$

$x^2 - 4x - 3 - 2x - 3 = 0$

$x^2 - 6x - 6 = 0$

$x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$

$x = \frac{6 \pm \sqrt{(-6)^2 - 4(1)(-6)}}{2(1)}$

$= \frac{6 \pm \sqrt{36+24}}{2}$

→ $x = \frac{6 \pm \sqrt{60}}{2}$

③ $x = 6.87$ or ③ $x = -0.87$

Sub ③ into ①

$y = 2(6.87) + 3$

$y = 16.74$

Sub ③ into ①

$y = 2(-0.87) + 3$

$y = 1.26$

∴ The line crosses the parabola at the points (6.87, 16.74) & (-0.87, 1.26).

Complete square to determine the vertex.

7. $y = 2x^2 + 4x - 6$

$y = 2(x^2 + 2x) - 6$

$\left(\frac{b}{2}\right)^2 = \left(\frac{2}{2}\right)^2 = 1$ $\quad y = 2(x^2 + 2x + 1 - 1) - 6$

$y = 2(x^2 + 2x + 1) - 2 - 6$

$y = 2(x^2 + 2x + 1) - 8$

$\left(\frac{b}{2}\right) = \frac{2}{2} = 1$ $\quad y = 2(x + 1)^2 - 8$

$\therefore$ The vertex is $(-1, -8)$.