**Year 12 mathematics: INTERSECTIONS OF LINES, PARABOLAS AND CIRCLES: ANSWERS.**

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| *1.* ***y = x²*** ***y = x + 6****x² = x + 6**x² – x – 6 = 0* *(x – 3)(x + 2)=0**x = 3 and x = –2**when x = 3, y = 9**when x = –2, y = 4**intersect at (3, 9) & (–2, 4)**2.* ***y = x² − 3x − 4*** ***y = x – 7*** *x – 7 = x² − 3x − 4**x² − 4x + 3 = 0**(x – 3)(x – 1) = 0**x = 3 and x = 1**when x = 3, y = –4**when x = 1, y = –6**intersect at (3, –4) & (1, –6)**3.* ***y = x² − 4*** ***y = 2x – 5***  *x² − 4 = 2x – 5* *x² − 2x + 1 = 0**(x – 1)² = 0**x = 1**when x =1, y = 2×1–5 = –3**tangent at (1, –3)**4.* ***y = x²*** ***y = x – 4*** *x² = x – 4* *x² – x + 4 = 0**no solution, no intersection**5****. y = x² + 2x – 8***  ***y = 2x – 4*** *x² + 2x – 8 = 2x – 4**x² – 4 = 0**(x + 2)(x – 2) = 0**x = –-2 and x = 2**when x = –2, y = – 8**when x = 2, y = 0**intersect at (2, 0) & (–2, –8)**6.* ***y = x² + x – 2***  ***y = 2x + p****x² + x – 2 = 2x + p**x² – x – 2 – p = 0**At point of tangency,**discriminant ∆ = 0**(-1)² – 4 ×1 × (-2 – p) = 0**1 + 8 + 4p = 0**p = –2.25* | *7.* ***y = 1 ↔ xy = 1*** ***x*** ***y = 2 – x*** *x(2 – x) = 1**2x – x² = 1**x² − 2x + 1 = 0**(x – 1)² = 0**x = 1**when x = 1, y = 1**tangent at (1,1)**8.* ***y = 1 ↔ xy = 1*** ***x*** ***y = 2x – 1*** *x(2x – 1) = 1**2x² − x −1 = 0**x = 1 and x = -0.5**when x = 1, y = 1**when x = -0.5, y = -2**intersect (1,1) & (-0.5, -2)**9.* ***y = 6 ↔ xy = 6*** ***x*** ***y = 7 – x*** *x(7 – x) = 6**7x – x² = 6**x² − 7x + 6 = 0**(x – 6)(x – 1) = 0**x = 6 and x = 1**when x = 6, y = 1**when x = 1, y = 6**intersect at (1, 6) and (6, 1)**10****. y = -4 ↔ xy = -4*** ***x*** ***y = x – 5****x(x – 5) = -4**x² − 5x + 4 = 0**(x – 1)(x – 4) = 0**x = 1 and x = 4**when x = 1, y = -4**when x = 4, y = -1**intersect at (1, -4) & (4, -1)* | *11.* ***y = 4 ↔ xy = 4*** ***x*** ***y = b – x*** *x(b – x) = 4**bx – x² = 4**x² − bx + 4 = 0**At point of tangency,* *discriminant ∆ = 0**(-b)² − 4 ×1 ×4 = 0**b² − 16 = 0* *b = -4 and b = 4**tangents when b=-4 & b=4.**12.* ***y = 2 ↔ xy = 2*** ***x*** ***y = mx + 8****x(mx + 8) = 2**mx² + 8x = 2**mx² + 8x − 2 = 0**At point of tangency,**discriminant ∆ = 0**8² – 4 ×m × -2 = 0**64 + 8m = 0**m = -8**13.* ***x² + y² = 25*** ***y = x – 1*** *x² + (x – 1) ² = 25**x² + x² − 2x + 1 = 25**2x² − 2x − 24 = 0**x = 4 and x = -3**when x = 4, y = 3**when x = -3, y = -4**intersect at (4, 3) & (-3, -4)**14.* ***x² + y² = 25*** ***y = 2x – 2****x² + (2x – 2)² = 25**x² + 4x² − 8x + 4 = 25**5x² − 8x – 21 = 0**x = 3 and x = -1.4* *when x = 3, y = 4**when x = -1.4, y = -4.8**intersect at (3, 4) and* *(-1.4, -4.8)* *15****. x² + y² = 5*** ***y = x + 1****x² + (x + 1)² = 5**x² + x² + 2x + 1 = 5**2x² +2x – 4 = 0**x = 1 and x = -2**when x = 1, y = 2**when x = -2, y = -1**intersect at (1, 2) & (-2, -1)* | *16.* ***x² + y² = 13*** ***y = x + 1****x² + (x + 1)² = 13**x² + x² + 2x + 1 = 13**2x² + 2x – 12 = 0**x = 2 and x = -3**when x = 2, y = 3**when x = -3, y = -2**intersect at (2, 3) & (-3, -2)**17.* ***x² + y² = 10*** ***y = 3x*** *x² + (3x)² = 10**x² + 9x² = 10**10x² = 10**x = 1 and x = -1**when x = 1, y = 3**when x = -1, y = -3**intersect at (1, 3) & (-1, -3)**18.* ***x² + y² = 8*** ***y = x + 4****x² + (x + 4)² = 8**x² + x² + 8x + 16 = 8**2x² +8x + 8 = 0**x = -2, y = 2**tangent at (-2, 2)**19.* ***x² + y² = 2******y = x + p****x² + (x + p)² = 2**x² + x² + 2px + p² − 2 = 0**2x² + 2px + p² − 2 = 0**At point of tangency,**discriminant ∆ = 0**(2p)² – 4× 2×(p² − 2) = 0**4p² − 8p² +16 = 0**-4p² = -16* *p = 2 and p = -2**20****. x² + y² = 2*** ***y = 1*** ***x****x² + (1)² = 2* *x**x4 + 1 = 2x²**x4 – 2x² + 1 = 0**x² = 1**x = 1 and x = -1**when x = 1, y = 1**when x = -1, y = -1**Intersect at (1,1) & (-1, -1)* |