0.2 (Appendix B and C in text) Lines, Circles, and Parabolas

Any line on the plane can be expressed in the form $y = mx + b$, where m is the slope and b is the y-intercept. Or, using a point (x_1, y_1), another form is $y - y_1 = m(x - x_1)$.

- $m = \frac{\Delta y}{\Delta x} = \frac{y_2 - y_1}{x_2 - x_1}$
- positive slope: $m > 0$
- negative slope: $m < 0$
- The slope of a horizontal line is zero.
- The slope of a vertical line is undefined.
- Parallel lines have the same slope.
- Perpendicular lines have negative reciprocal slopes.

Ex0.10) Find the equation of the line passing through (2,1) and perpendicular to the line $8x - 13y = 13$.

The distance between two points (x_1, y_1) and (x_2, y_2) is $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$.

Given a point (h, k) in the plane, the <u>circle</u> of radius r centred at (h, k) is the set of all points that are distance r from (h, k). That is, all (x, y) that are distance r from (h, k).

Thus, the standard equation of a circle with centre (h, k) and radius r is

$$(x-h)^2 + (y-k)^2 = r^2$$

For example, the <u>unit circle</u> is centered at the origin and has radius 1. Thus, the equation of the unit circle is $x^2 + y^2 = 1$.

Ex0.11) Draw the circle with equation $x^2 + y^2 - 6x + 10y + 30 = 0$.

Graphs of equations with the form of $y = ax^2 + bx + c$ with $a \neq 0$ are called <u>parabolas</u>.

The parabola with equation $y = a(x-h)^2 + k$ has its <u>vertex</u> at (h, k). The graph opens upward if $a > 0$ and opens downward if $a < 0$. Also, the larger a is, the skinnier the parabola gets.

Ex0.12) Graph $y = x^2 + x + 1$.

Continue with Appendix B ODDS and Appendix C ODDS (omit 11-32).