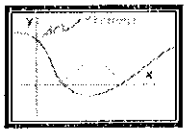
GRAPHS AND MODELS

Keeper 8
Honors Calculus

INTERCEPTS OF A GRAPH



- An x-intercept is a point on the graph where the graph crosses the x-axis.
- A y-intercept is a point on the graph where the graph crosses the y-axis.

EXAMPLE – FIND THE INTERCEPTS

$y = x^3 - 4x$

x-int: $0 = x^3 - 4x$, $0 = x(x^2 - 4)$, $0 = x(x-2)(x+2)$, $x = 0, 2, -2$

y-int: $y = 0^3 - 4(0)$, $y = 0$ → (0, 0)

(0, 0)
(2, 0)
(-2, 0)

EXAMPLE – FIND THE INTERCEPTS

$y = x^2 + x - 2$

x-int: $0 = x^2 + x - 2$, $0 = (x+2)(x-1)$, $x = -2, 1$

(-2, 0)
(1, 0)

y-int: (0, -2)

EXAMPLE – FIND THE INTERCEPTS

$y = x^2\sqrt{9 - x^2}$

x-int: $0 = x^2\sqrt{9-x^2}$, $0 = x^2$ or $0 = \sqrt{9-x^2}$, $x = 0$ or $0 = 9 - x^2$, $x = \pm 3$

(0, 0)
(3, 0)
(-3, 0)

y-int: $y = 0^2\sqrt{9-0^2}$, $= 0$ → (0, 0)

EXAMPLE – FIND THE INTERCEPTS

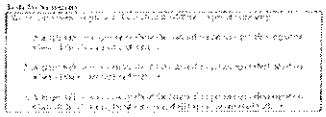
$y = 2x - \sqrt{x^2 + 1}$

x-int: $0 = 2x - \sqrt{x^2+1}$, $\sqrt{x^2+1} = 2x$, $x^2 + 1 = 4x^2$, $1 = 3x^2$, $\frac{1}{3} = x^2$, $\pm\sqrt{\frac{1}{3}} = x$, $\pm\frac{\sqrt{3}}{3} = x$

$\left(\frac{\sqrt{3}}{3}, 0\right)$
$\left(-\frac{\sqrt{3}}{3}, 0\right)$

y-int: $y = 0 - \sqrt{1}$, $= -1$ → (0, -1)

SYMMETRY OF A GRAPH



EXAMPLE: TESTING FOR SYMMETRY

Determine the symmetry of the equation:

$y = 2x^3 - x$

Test odd: $f(-x) = -f(x)$

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

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

odd

EXAMPLE: TESTING FOR SYMMETRY

Determine the symmetry of the equation:

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

Test even: $f(x) = f(-x)$

$x^2 - 6x^4 + 2 = (-x)^2 - 6(-x)^4 + 2$

$x^2 - 6x^4 + 2 = x^2 - 6x^4 + 2$

Even

EXAMPLE: TESTING FOR SYMMETRY

Determine the symmetry of the equation:

$y = 2x^3 - x^5$

Odd

EXAMPLE: TESTING FOR SYMMETRY

Determine the symmetry of the equation:

$y^4 + x^3 - 5x = 0$

Neither

EXAMPLE: TESTING FOR SYMMETRY

Determine the symmetry of the equation:

$y = x^3 + x^2 + x + 1$

Neither

EXAMPLE: TESTING FOR SYMMETRY

Determine the symmetry of the equation:

$x^2 + y^2 = 1$

Both

FINDING POINTS OF INTERSECTION

Set the two equations equal to each other and solve!

EXAMPLE: FINDING INTERSECTIONS

$y = 2x - 1$ and $y = x + 1$

$2x - 1 = x + 1$

$x = 2$

$(2, 3)$

EXAMPLE: FINDING INTERSECTIONS

$x^2 - y = 3$ and $x - y = 1$

$y = x^2 - 3 \quad y = x - 1$

$x^2 - 3 = x - 1$

$x^2 - x - 2 = 0$

$(x - 2)(x + 1) = 0$

$x = 2, -1$

$(2, 1) \quad (-1, -2)$

EXAMPLE: FINDING INTERSECTIONS

$y = x^2 - 2x - 3$ and $y = 2x - 3$

$x^2 - 2x - 3 = 2x - 3$

$x^2 - 4x = 0$

$x(x - 4) = 0$

$x = 0, 4$

$(0, -3) \quad (4, 5)$

EXAMPLE: FINDING INTERSECTIONS

$y = x^2 - 1$ and $y = 2x - 3$

$x^2 - 1 = 2x - 3$

$x^2 - 2x + 2 = 0$

$\frac{2 \pm \sqrt{4 - 4(1)(2)}}{2}$

$\frac{2 \pm \sqrt{4 - 8}}{2}$

$\frac{2 \pm \sqrt{-4}}{2}$

Imaginary

DNE