Math 30, Homework 1 on sections 1.2, 1.3

Write all your working out and answers on your own notepaper - no need to write the questions. Please use lots of space.

It is very important that you show clearly any work you had to do to get your answers. Just writing the answer down with no work shown is usually not enough. Do all 15 questions - they are worth 2 points each. Hand in your solutions next week only.

For these first 10 questions, *check that your answers match the solutions on page 4*. If you don't get the same answer then go back and see where you went wrong.

(1) Find the domain and range of this relation and say if it is a function:

$$\{(0,3),(3,2),(4,2),(2,0)\}.$$

(2) Does the equation $x^2 + y^2 = 4$ define y as a function of x? (Hint: for each x, such as 0 or 2, is there a unique y?)

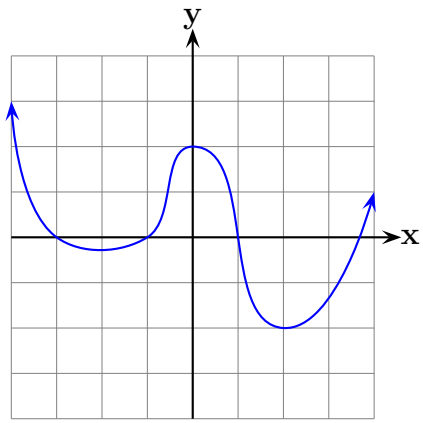
(3) For the function $f(x) = x^2 + 3x - 2$, find

- **(a)** $f(0)$
- **(b)** $f(4)$
- **(c)** $f(-3)$

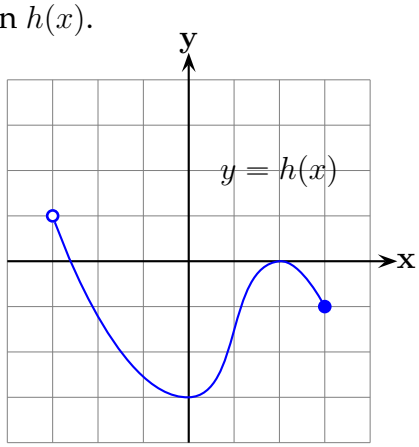
(4) For the function $g(x) = 3x^2 + 8x$, compute and simplify

- **(a)** $g(-x)$
- **(b)** $g(x+2)$

(5) Is this the graph of a function?



(6) This is the graph of the function $h(x)$.



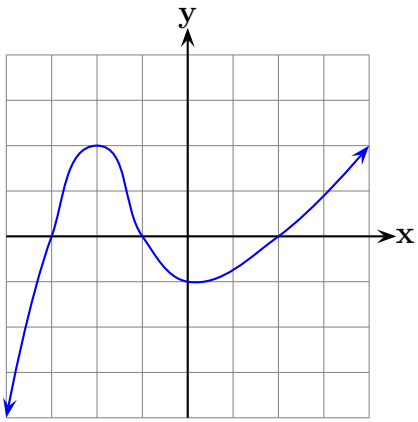
Find the following:

(a) $h(2)$

(b) the domain of h

(c) the range of h

(7) For this graph of a function,



find

(a) all its x-intercepts,

(b) its y-intercept.

(8) For the graph in question 6, find

(a) all intervals where it is increasing,

(b) all intervals where it is decreasing,

(c) all intervals where it is constant,

(d) any x values where the function has a relative minimum,

(e) any x values where the function has a relative maximum.

(9) For the graph in question 7, find

(a) all intervals where it is increasing,

(b) all intervals where it is decreasing,

(c) all intervals where it is constant,

(d) any x values where the function has a relative minimum,

(e) any x values where the function has a relative maximum.

(10) For the graphs of the following two equations, decide if they have symmetry with respect to the x-axis, the y-axis, the origin, or none of these symmetries. (Hint: replace x by $-x$ and y by $-y$ and see if you get the same equation.)

(a) $y^2 = 3x - 1$

(b) $x^2 + y^2 = 9$

Five more questions. Show clearly all your working out and reasoning. Only do these questions when you are sure you understand the first ten.

(11) For the function $f(x) = \sqrt{2x - 8}$, find

(a) $f(12)$

(b) $f(4)$

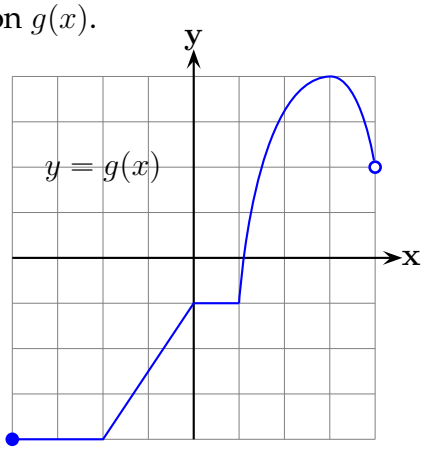
(c) $f(5)$

(12) For the function $h(x) = x^3 - x + 1$, compute and simplify

(a) $h(-x)$

(b) $h(x - 2)$

(13) This is the graph of the function $g(x)$.



Find the following:

(a) $g(-2)$

(b) the domain of g

(c) the range of g

(d) the y-intercept

(e) any x-intercepts

(14) For the graph in question 13, find

(a) all intervals where it is increasing,

(b) all intervals where it is decreasing,

(c) all intervals where it is constant,

(d) any x values where the function has a relative minimum,

(e) any x values where the function has a relative maximum.

(15) For the graphs of the following two equations, decide if they have symmetry with respect to the x-axis, the y-axis, the origin, or none of these symmetries.

(a) $y = \dfrac{x^2+1}{x^2}$

(b) $y = 3x + 1$

Answers to questions (1)-(10):

(1) The domain is $\{0, 2, 3, 4\}$, the range is $\{0, 2, 3\}$ and it is a function.

(2) No (say why not).

(3) (a) $f(0) = -2$, (b) $f(4) = 26$, (c) $f(-3) = -2$.

(4) (a) $g(-x) = 3x^2 - 8x$, (b) $g(x+2) = 3x^2 + 20x + 28$.

(5) Yes (say why).

(6) (a) $h(2) = 0$, (b) domain of h is $(-3, 3]$, (c) range of h is $[-3, 1)$.

(7) (a) x-intercepts are $(-3, 0), (-1, 0), (2, 0)$, (b) y-intercept is $(0, -1)$.

(8) (a) increasing on $(0, 2)$, (b) decreasing on $(-3, 0) \cup (2, 3)$,
(c) never constant, (d) relative min at $x = 0$, (e) relative max at $x = 2$.

(9) (a) increasing on $(-\infty, -2) \cup (0, \infty)$, (b) decreasing on $(-2, 0)$,
(c) never constant, (d) relative min at $x = 0$, (e) relative max at $x = -2$.

(10) (a) just symmetric with respect to x-axis, (b) symmetric with respect to the x-axis, the y-axis and the origin.