**MATH 30 - Precalculus. Homework 1. Due Th. 02/07/2019.** Professor Luis Fernández

If you hand it in, please use this sheet for your graphs or short answers; **STAPLE** any additional sheets.

**1.** For the function $f(x) = 3x - 5$, find (and simplify when possible)

**a)** $f(3) = 4$ **b)** $f(-4) = -17$ **c)** $f(t) = 3t - 5$

**d)** $f(x+1) = 3(x+1) - 5 = 3x - 2$ **e)** $f(-x) = -3x - 5$ **f)** $f(x^2) = 3x^2 - 5$

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**2.** For the function $f(x) = \dfrac{3x^2 - 1}{x^2}$, find (and simplify when possible)

**a)** $f(2) = \frac{11}{4}$ **b)** $f(-1) = 2$ **c)** $f(r) = \dfrac{3r^2 - 1}{r^2}$

**d)** $f(x-1) = \dfrac{3(x-1)^2 - 1}{(x-1)^2} = \dfrac{3x^2 - 6x + 2}{(x-1)^2}$ **e)** $f(-x) = \dfrac{3(-x)^2 - 1}{(-x)^2} = \dfrac{3x^2 - 1}{x^2}$ **f)** $f(x^3) = \dfrac{3x^6 - 1}{x^6}$

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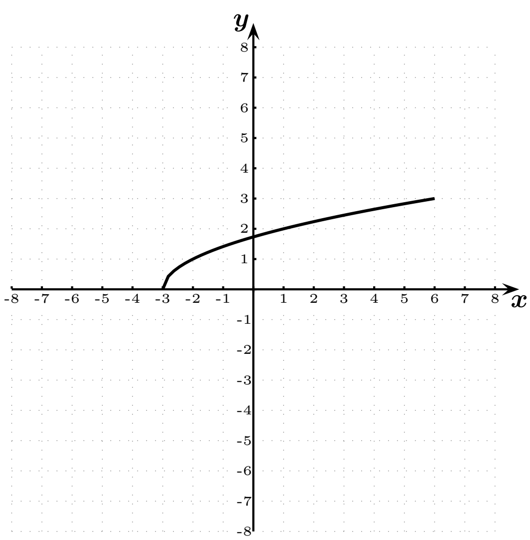
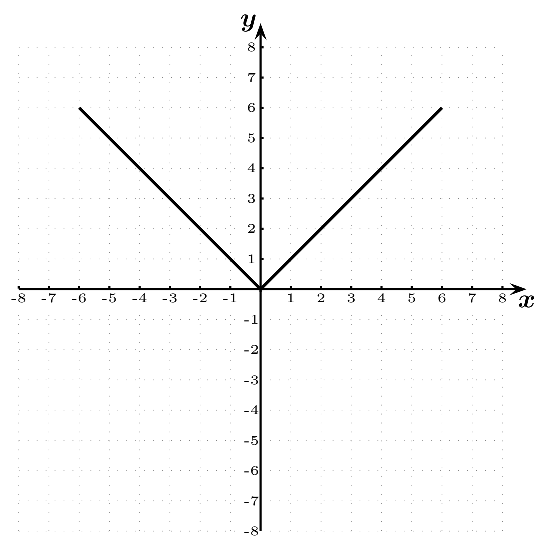
**3.** Make a table of values (take, for example, the integers between $-6$ and 6; you may want to use a calculator) and graph the following functions in the axes provided.

**a)** $f(x) = \sqrt{x+3}$




**b)** $g(x) = |x|$
(remember that $|x|$ means 'absolute value of $x$')

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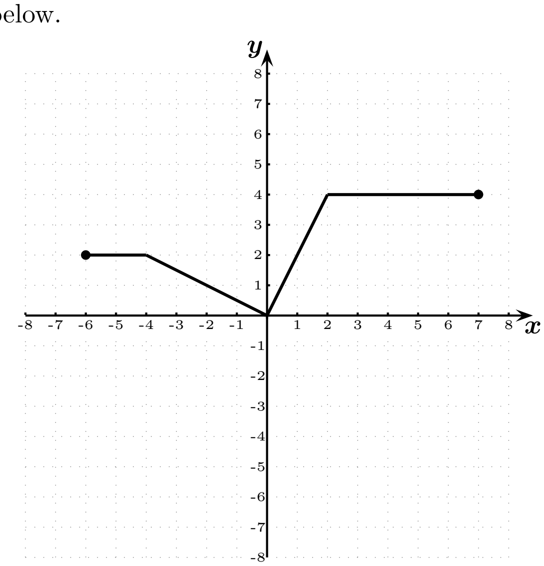
**4.** Use the given graph of the function $g$ to answer the questions below.




**a)** Find $g(-2) = 1$ **b)** Find $g(0) = 0$

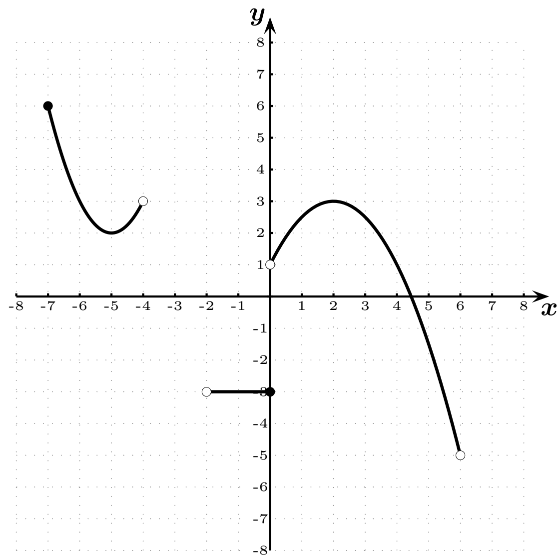
**c)** Find $g(1) = 2$ **d)** Find $g(-3) = 1.5$

**e)** Find $g(4) = 4$ **f)** Find $g(7) = 4$

**g)** Find the domain of $g$ and write it in interval notation.
$[-6, 7]$

**h)** Find the range of $g$ and write it in interval notation.
$[0, 4]$

**5.** Use the graph of the function $f$ given below to find




**a)** The domain of $f$. $[-7,-4) \cup (-2,0) \cup (0,6)$

**b)** The range of $f$. $(-5,6]$

**c)** The interval(s) where $f$ is increasing. $(-5,-4) \cup (0,2)$

**d)** The interval(s) where $f$ is decreasing. $(-7,-5) \cup (2,6)$

**e)** The interval(s) where $f$ is constant. $(-2,0)$

**f)** The relative maxima of $f$. At $x=-7$, $f(-7)=6$ and at $x=2$, $f(2)=3$

**g)** The relative minima of $f$. At $x=-5$, $f(-5)=2$

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**6.** For the function $f(x)=x^2-x+1$, find and simplify the difference quotient $f(x)=\dfrac{f(x+h)-f(x)}{h}$.

$$f(x)=\frac{f(x+h)-f(x)}{h}=\frac{[(x+h)^2-(x+h)+1]-(x^2-x+1)}{h}$$
$$=\frac{x^2+2xh+h^2-x-h+1-x^2+x-1}{h}=\frac{h(2x+h-1)}{h}$$
$$=2x+h-1$$

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**7.** Use the following procedure to determine whether the functions below are even, odd or neither:

To find whether the function $f$ is even, odd, or neither,

1. Find $f(-x)$ and simplify it (remember that, for example, $(-x)^2=x^2$, and $(-x)^3=-x^3$).
2. Compare $f(-x)$ with $f(x)$:

- If $f(-x)=f(x)$ then the function is even.
- If $f(-x)=-f(x)$ then the function is odd.
- If none of the above, the function is neither (most functions are neither).

**a)** $f(x)=x^2+4$.

1. $f(-x)=(-x)^2+4=x^2+4$
2. $f(x)=x^2+4$ also. Therefore $f$ is an even function.

**b)** $g(x)=\dfrac{x^3}{x^2+4}$.

1. $g(-x)=\dfrac{(-x)^3}{(-x)^2+4}=\dfrac{-x^3}{x^2+4}=-\dfrac{x^3}{x^2+4}$
2. $-g(x)=-\dfrac{x^3}{x^2+4}$ also. Therefore $g$ is an odd function.

**c)** $h(x)=x^2+x$.

1. $h(-x)=(-x)^2+(-x)=x^2-x$.
2. $h(x)=x^2+x\neq x^2-x$ (so $h$ is not even);
   $-h(x)=-x^2-x\neq x^2-x$ (so $h$ is not odd).
   Therefore $h$ is neither even nor odd.

**8.** Convert from radians to degrees.

**a)** $\dfrac{\pi}{3} = 60°$

**b)** $\dfrac{5\pi}{4} = 225°$

**c)** $\dfrac{5\pi}{6} = 150°$

**d)** $3 = 540/\pi \approx 171.887°$

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**9.** Convert from degrees to radians.

**a)** $300° = 5\pi/6$

**b)** $135° = 3\pi/4$