Worksheet 2

MATH 006B - Schmidt

Winter 2021

Instructions:

- **Show ALL your work to receive credit!** Cross off anything you do not wish to be graded.
- Simplify your answers as much as possible. For instance, evaluate 2^2, but not $\sqrt{2}$.
- **Work with your group** on the following exercises. Each of you will turn in your own work via Gradescope.
- **Your group** may ask the TA questions, which the TA will answer with leading questions (not answers) to help guide you to the answer.

1. (5 points) The graph of $f(x)$ is given below. Assume f is defined for all real numbers and continues the behavior seen in the graph (so if f is increasing/decreasing when it leaves the graphing window, it continues to increase/decrease). Use the graph to estimate the location(s) of the following features **to the nearest integer** (e.g. if you think the answer is about 6.13, you should say 6) or $\pm\infty$, if applicable.

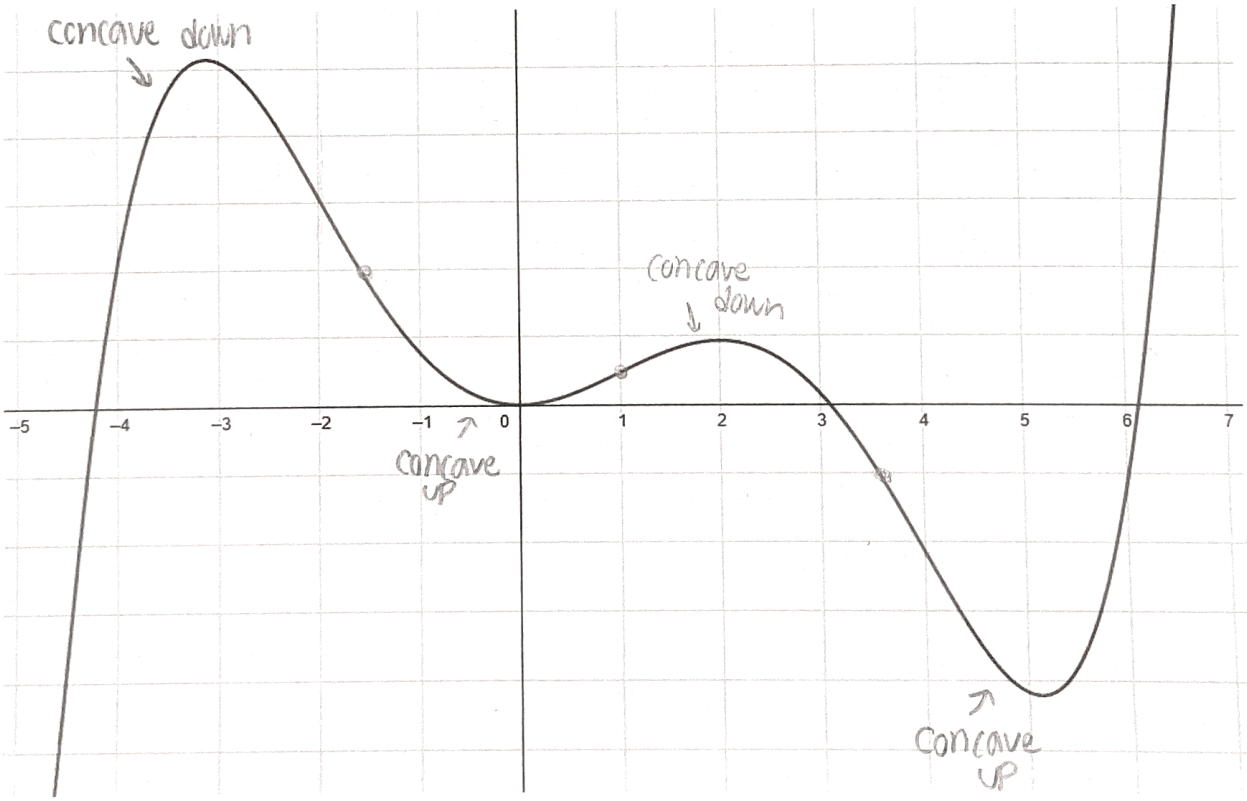
line goes up → (a) Interval(s) on which f is increasing. : $(-\infty,-3) \cup (0,2) \cup (5,\infty)$

line goes down → (b) Interval(s) on which f is decreasing. : $(-3,0) \cup (2,5)$

∪ → (c) Interval(s) on which f is concave up. : $(-2,1), (3,\infty)$

∩ → (d) Interval(s) on which f is concave down. : $(-\infty,-2), (0,4)$

b/w concavity → (e) x-values at which f has an inflection point (i.e. you don't need to estimate y-coordinates). $X = -1.5, 1, 3.5$



2. (5 points) Consider the function $h(x) = -4x^2$.

(a) Sketch the graph of h.

(b) **True or False:** The value of x decreases as x changes from -3 to -1. → It is false b/c the line is increasing in order to make a concave down. ↗∩.

(c) **Fill in the Blanks:**

In terms of increasing to decreasing →

- As x changes from -3 to -1, $h(x)$ changes from __+__ to __+__.
- As x changes from -1 to 1, $h(x)$ changes from __+__ to __−__.

(d) **True or False:** The average rate of change on the interval from -3 to -1 is greater than the average rate of change on the interval from -1 to 1. **Justify** by calculating both average rates of change, showing all work. The greater average rate of change would be -3 to -1 according to my calculations.

(e) Is $h(x)$ concave up, concave down, neither, or both on the interval $(-\infty, \infty)$?

h(x) is concave down b/c x^2 is a parabola and the -4 makes the parabola have a maxima.

3. (4 points) Write an equation for $g(x)$ in terms of $f(x)$, where $g(x)$ is determined by applying the following transformations to f **in the order given.**

$g(x) = af(b(x+c))+d$

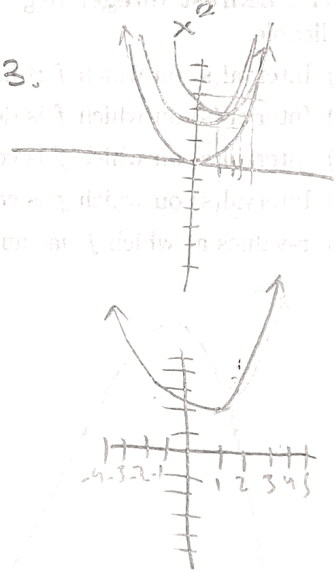
$g(x) = a\,f(x+c)+d$

(i) Shift f up by 2. $g(x) = x^2 + 2$

(ii) Shift the result of (i) right by 1. $g(x) = (x-1)^2 + 2$

(iii) Flip the result of (ii) across the x-axis. $g(x) = -(x-1)^2 + 2$

3.

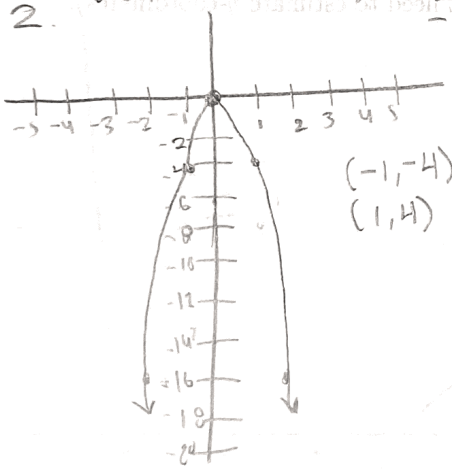


$g(x) = -(x-1)^2 + 2$

4. (1 point) Participation

2.

$(-3,-36)\ (-1,-4)$ $\frac{-36+4}{-3+1} = \frac{-32}{-2} \to 16$



$(-1,-4)$ $\frac{-4-4}{-1-1} = \frac{-8}{-2} \to 4$

$(1,4)$