Unit 3 Curve Sketching Review 1A Name: ________________________

1. Find the absolute maximum and minimum of:
   a) $f(x) = 4 - x^2$ on $[-3,1]$
   b) $f(x) = \sqrt{4 - x^2}$ on $[-2,1]$

2. Find the value of ***c*** that satisfies the Mean Value Theorem:
   a) $f(x) = x^2$ on $[0,2]$
   b) $f(x) = \sqrt{x-1}$ on $[1,3]$

3. *i*) Find the intervals on which the function is increasing and decreasing:
   ii) Identify the local maximums and minimums:
   a) $g(x) = -3x^2 + 3x + 5$
   b) $h(x) = (x+7)^3$

4. *i)* Find the intervals on which the function is concave up and concave down:
   ii) Identify any inflection points:
   a) $y = -x^2 - 2x + 6$
   b) $y = x(6 - 2x)^2$

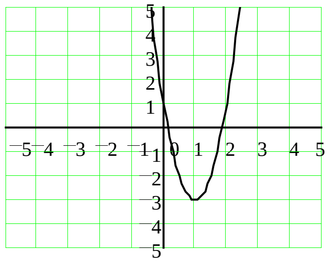
5. *i)* Find the intervals on which the function is increasing and decreasing:
   ii) Find the local extrema
   iii) Find the intervals on which the function is concave up and concave down:
   iv) Find the inflection points:
   v) Sketch a graph of the curve:
   a) $y = x^4 - 4x^3 + 10$
   b) $y = x^{1/5}$

6. If $y' = x^2 - x - 6$, sketch the graph of y.

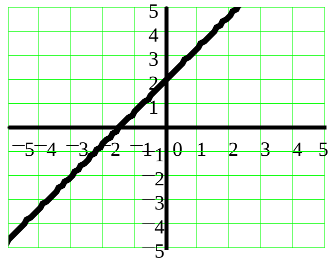
7. If $y' = 2x - 6$, sketch the graph of y.

8. The following graphs are graphs of the derivatives of a function. By making sign line graphs of the first and second derivative, sketch the graph of $f(x)$.

a)



b)



9. Find the equations of the asymptotes of the following functions:

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

b) $y = \dfrac{x^2 - 4}{(x-2)(x+3)}$

c) $y = \dfrac{x-1}{x^2(x-2)}$

10. Graph the following:

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

b) $y = \dfrac{x^2}{x^2 + 5x - 14}$ (optional – really gnarly)

Unit 3 Curve Sketching Review 1A Solutions

1. a) absolute min at: $(-3,-5)$

   absolute max at: $(0,4)$

   b) absolute min at: $(-2,0)$

   absolute max at: $(0,2)$

2. a) $c=1$ b) $c=3/2$

3. a) increasing: $(-\infty,1/2)$

   decreasing: $(1/2,\infty)$

   local max: $(1/2,23/4)$

   local min: none

   b) increasing: $(-\infty,-7)$ and $(-7,\infty)$

   decreasing: never

   local max: none

   local min: none

4. a) concave up: never

   concave down: $(-\infty,\infty)$

   inflection points: none

   b) concave up: $(2,\infty)$

   concave down: $(-\infty,2)$

   inflection point: $(2,8)$

5. a) increasing: $(3,\infty)$

   decreasing: $(-\infty,0)U(0,3)$

   local min: $(3,-17)$

   concave up: $(-\infty,0)$ and $(2,\infty)$

   concave down: $(0,2)$

   inflection pts: $(0,10)$ and $(2,-6)$

   b) increasing: $(-\infty,0)$ and $(0,\infty)$

   decreasing: never

   no local max or min

   concave up: $(-\infty,0)$

   concave down: $(0,\infty)$

   inflection point: $(0,0)$

6. see graph

7. see graph

8. a) see graph

   b) see graph

9. a) $x=-1$ and $y=2$

   b) $x=-3$ and $y=1$

   c) $x=0,2$ and $y=0$

10. a) see graph

    b) see graph

Unit 3 Curve Sketching Review 1B

1. Find the absolute maximum and minimum of:

   a) $f(x)=x^3-12x$ on $[-5,4]$ b) $f(x)=x^2-1$ on $[-1,2]$

2. Find the value of ***c*** that satisfies the Mean Value Theorem:

   a) $f(x)=x^2-3x+2$ on $[0,1]$ b) $f(x)=\sqrt{x-4}$ on $[4,8]$

3. *i*) Find the intervals on which the function is increasing and decreasing:

   ii) Identify the local maximums and minimums:

   a) $g(x)=x^3-3x^2+3$ b) $h(x)=x^3(8-x)$

4. *i)* Find the intervals on which the function is concave up and concave down:

   ii) Identify any inflection points:

   a) $y=-x^3+6x^2-9x+3$ b) $y=x^2(2x^2-9)$

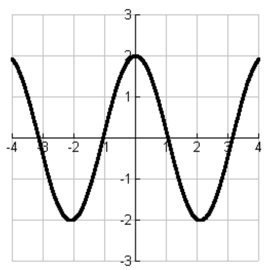
5. *i)* Find the intervals on which the function is increasing and decreasing:
   ii) Find the local extrema
   iii) Find the intervals on which the function is concave up and concave down:
   iv) Find the inflection points:
   v) Sketch a graph of the curve:

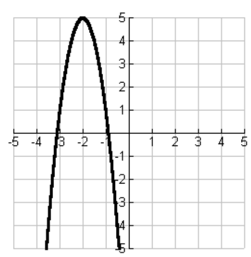
   a) $y = \left(x^2 - 3\right)^2$ b) $y = x^{2/3}$

6. If $y' = 16 - x^2$, sketch the graph of *y*.

7. If $y' = -5x + 10$, sketch the graph of *y*.

8. The following graphs are graphs of the derivatives of a function. By making sign line graphs of the first and second derivative, sketch the graph of $f(x)$.

a) 

b) 

9. Find the equations of the asymptotes of the following functions:

   a) $y = \dfrac{x+5}{x-7}$ b) $y = \dfrac{x}{(x-5)(x+1)}$ c) $y = \dfrac{x^2 - 9}{(x+3)(x-1)}$

10. Graph the following:

a) $y = \dfrac{x-2}{x+5}$ b) $y = \dfrac{-2}{x^2 - 25}$ (optional)

Unit 3 Curve Sketching Review 1B Solutions

1. a) absolute min at: $(-5,-65)$

   absolute max at: $(-2,16)$ and $(4,16)$

   b) absolute min at: $(0,-1)$

   absolute max at: $(2,3)$

2. a) $c = 1/2$ b) $c = 5$

3. a) increasing: $(-\infty,0)$ and $(2,\infty)$

   decreasing: $(0,2)$

   local max: $(0,3)$

   local min: $(2,-1)$

   b) increasing: $(-\infty,0) \cup (0,6)$

   decreasing: $(6,\infty)$

   local max: $(6,432)$

   local min: none

4. a) concave up: $(-\infty,2)$

   concave down: $(2,\infty)$

   inflection points: $(2,1)$

   b) concave up: $(-\infty,-\sqrt{3}/2)$ and $(\sqrt{3}/2,\infty)$

   concave down: $(-\sqrt{3}/2,\sqrt{3}/2)$

   inflection points: $(\sqrt{3}/2,-45/8)$, $(-\sqrt{3}/2,-45/8)$

5. a) increasing: $(-\sqrt{3},0)$ and $(\sqrt{3},\infty)$

   decreasing: $(-\infty,-\sqrt{3})$ and $(0,\sqrt{3})$

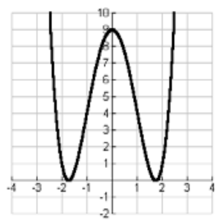
   local min: $(-\sqrt{3},0)$ and $(\sqrt{3},0)$

   local max: $(0,9)$

   concave up: $(-\infty,-1)$ and $(1,\infty)$

   concave down: $(-1,1)$

   inflections points: $(-1,4)$ and $(1,4)$



b) increasing: $(0,\infty)$

decreasing: $(-\infty,0)$

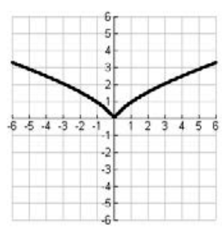
local max: none

local min: $(0,0)$

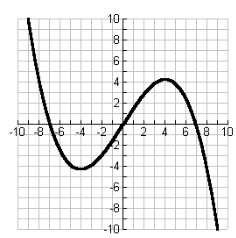
concave up: never

concave down: $(-\infty,0)$ and $(0,\infty)$

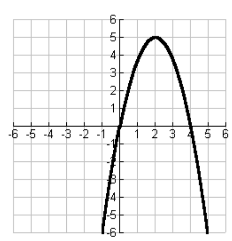
inflection point: none



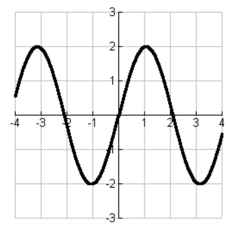
6. Sample Graph:



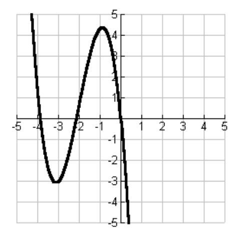
7. Sample Graph:



8. Sample Graphs:



a)



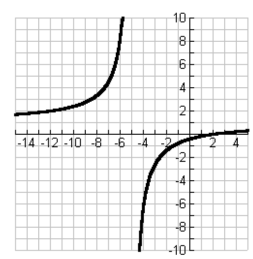
b)

9. a) $x = 7$ and $y = 1$

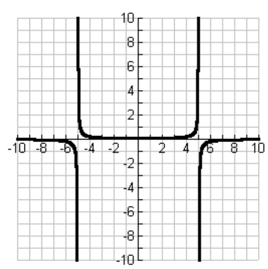
   b) $x = 5,-1$ and $y = 0$

   c) $x = 1$, and $y = 1$

10.



a)



b)