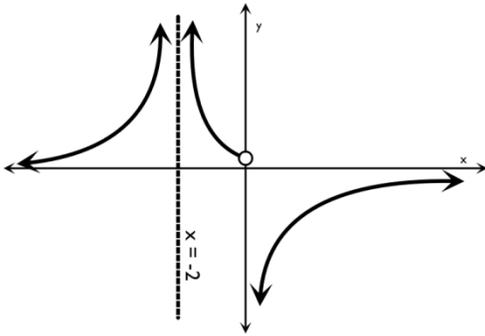


# Graphing & Basic Optimization

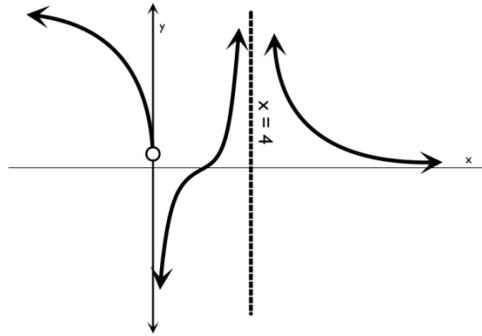
## 5.1A – Graphing Using Derivatives

Find the interval for which the derivative is positive and the interval for which the derivative is negative.

#1)

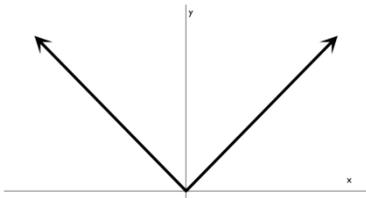


#2)

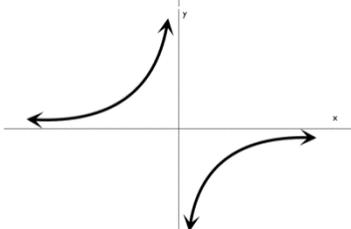


The first column shows graphs of four functions and the second column shows the graphs of their derivatives. Match each function with its derivative.

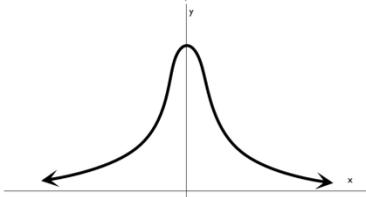
#3)



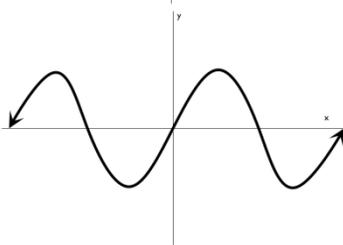
#4)



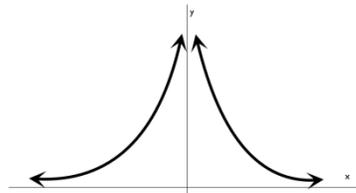
#5)



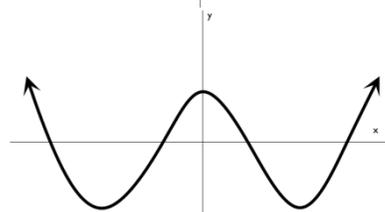
#6)



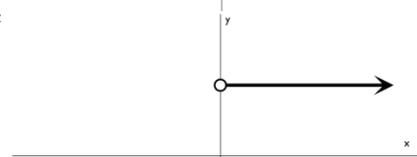
a



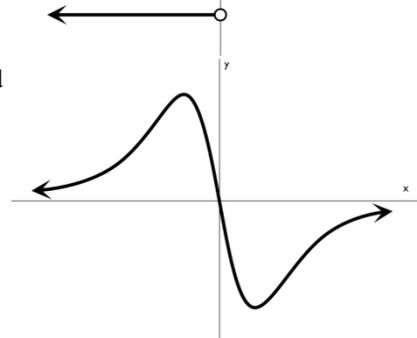
b



c



d



# Graphing & Basic Optimization

## 5.1A – Graphing Using Derivatives

Find the critical values of each function.

(On day 1, just find CV from 1<sup>st</sup> derivative. On day 2, find CV from 2<sup>nd</sup> derivative.)

#7)  $f(x) = x^3 - 48x$

#10)  $f(x) = (2x - 6)^4$

#8)  $f(x) = x^3 - 6x^2 - 15x + 30$

#11)  $f(x) = 3x + 5$

#9)  $f(x) = x^4 + 4x^3 - 8x^2 + 1$

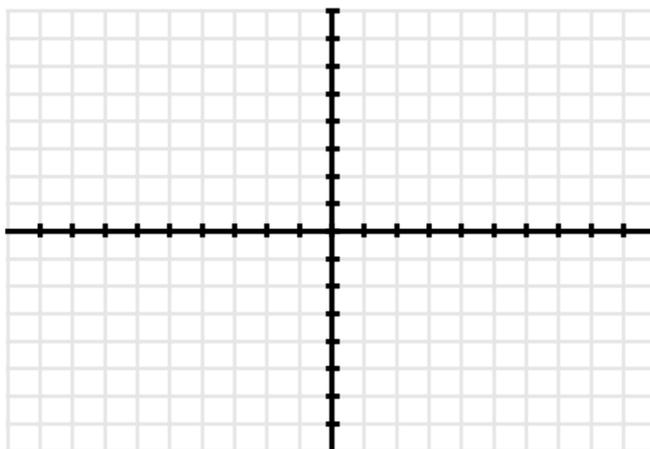
#12)  $f(x) = x^3 + x^2 - x + 4$

# Graphing & Basic Optimization

## 5.1A – Graphing Using Derivatives

Sketch the graph of each function by hand using a sign diagram. (On day 1, use first derivative sign diagram. On day two, use the second derivative sign diagram.)

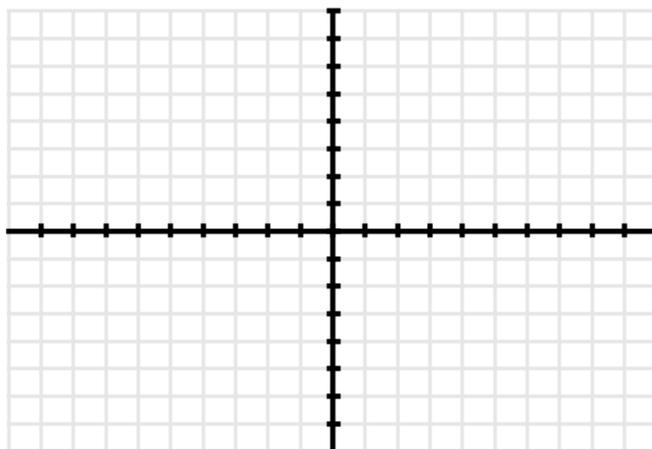
#13)  $f(x) = x^3 - 3x^2 - 9x + 10$



# Graphing & Basic Optimization

## 5.1A – Graphing Using Derivatives

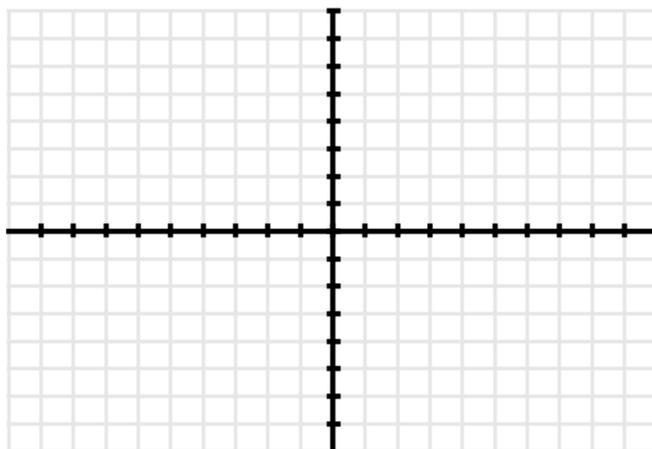
#14)  $f(x) = x^4 + 4x^3 - 8x^2 + 64$



# Graphing & Basic Optimization

## 5.1A – Graphing Using Derivatives

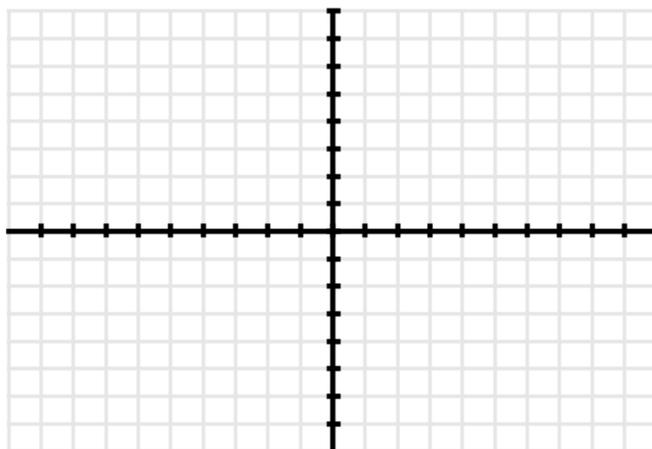
#15)  $f(x) = -x^4 + 4x^3 - 4x^2 + 1$



# Graphing & Basic Optimization

## 5.1A – Graphing Using Derivatives

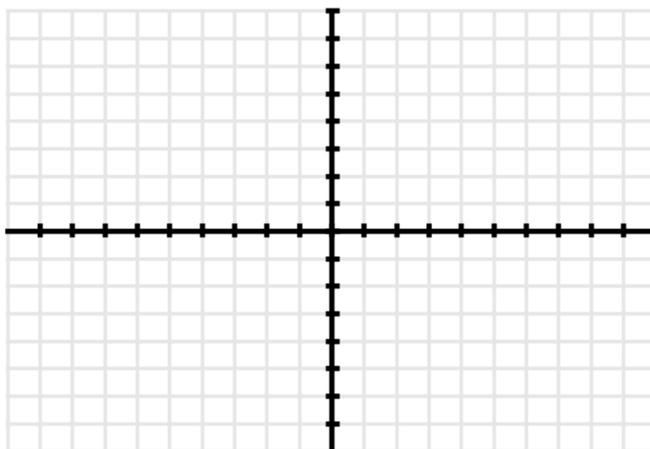
#16)  $f(x) = 3x^4 - 8x^3 + 6x^2$



# Graphing & Basic Optimization

## 5.1A – Graphing Using Derivatives

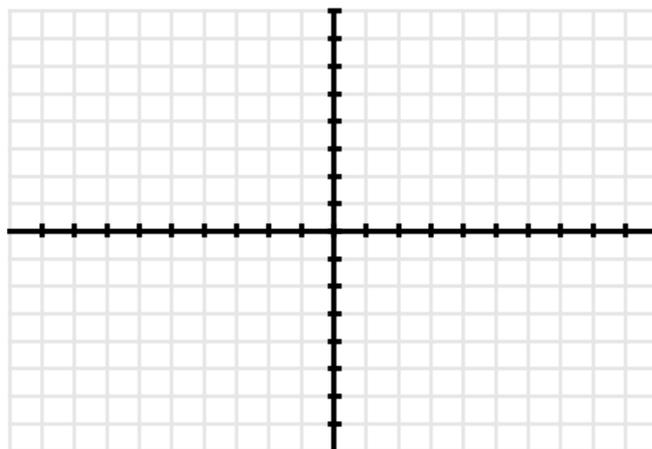
#17)  $f(x) = (x - 1)^6$



# Graphing & Basic Optimization

## 5.1A – Graphing Using Derivatives

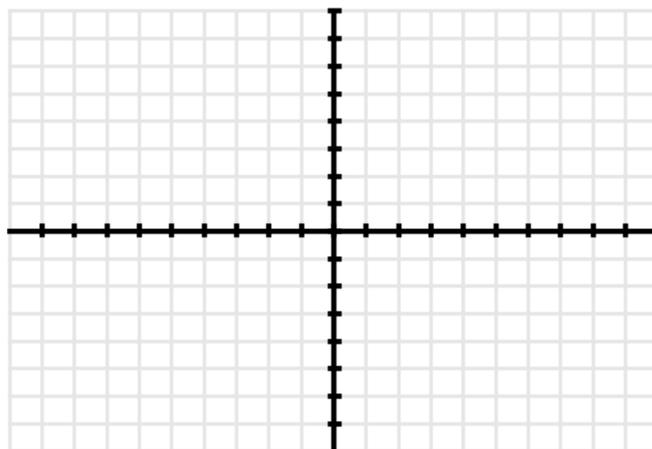
#18)  $f(x) = (x^2 - 4)^2$



# Graphing & Basic Optimization

## 5.1A – Graphing Using Derivatives

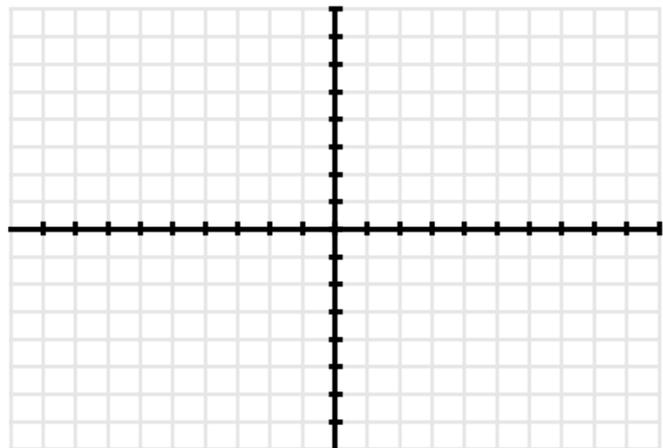
#19)  $f(x) = 0.01x^5 - 0.05x$



# Graphing & Basic Optimization

## 5.1A – Graphing Using Derivatives

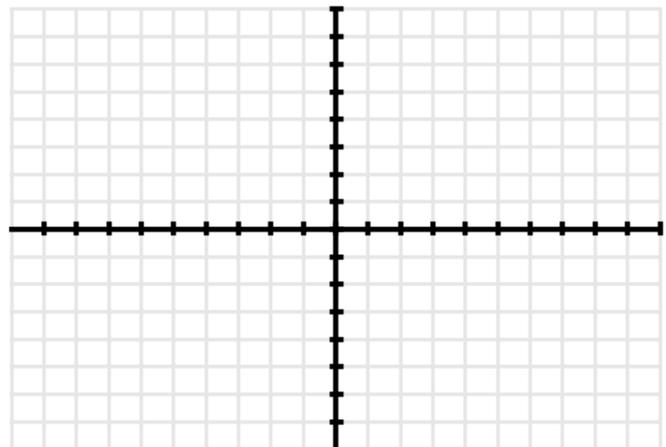
#20)  $f(x) = x^3 - 2x^2 + x + 11$



# Graphing & Basic Optimization

## 5.1A – Graphing Using Derivatives

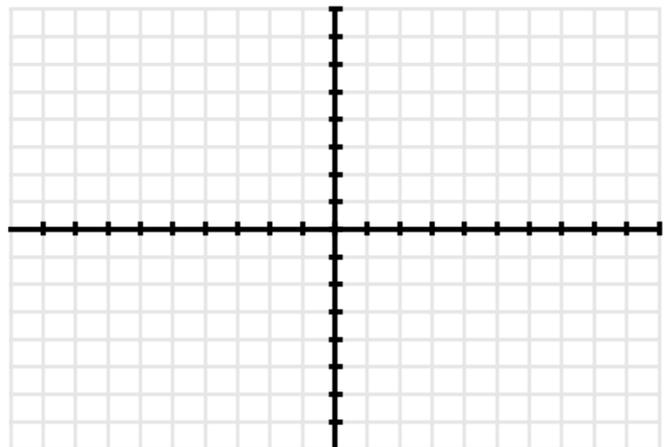
#21)  $f(x) = \sqrt{400 - x^2}$



# Graphing & Basic Optimization

## 5.1A – Graphing Using Derivatives

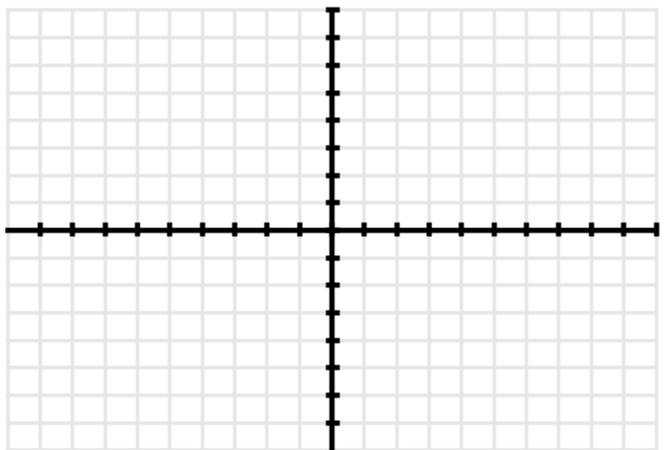
#22)  $f(x) = \frac{1}{x^2 - 2x - 8}$



# Graphing & Basic Optimization

## 5.1A – Graphing Using Derivatives

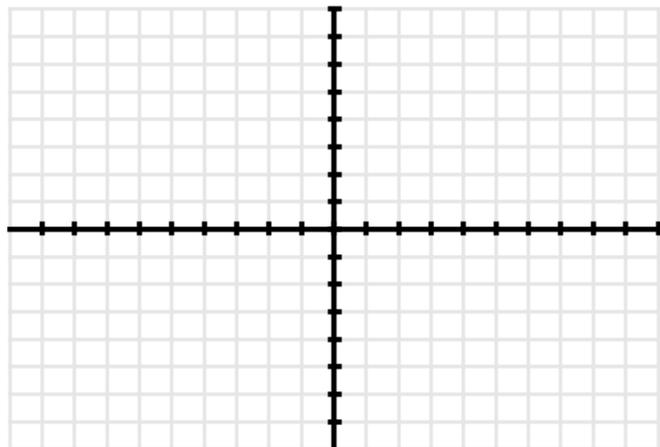
#23)  $f(x) = \frac{8}{x^2+4}$



# Graphing & Basic Optimization

## 5.1A – Graphing Using Derivatives

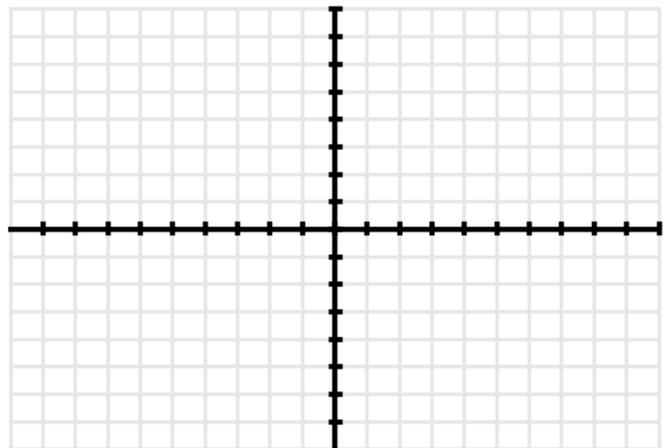
#24)  $f(x) = \frac{x^2}{x^2+1}$



# Graphing & Basic Optimization

## 5.1A – Graphing Using Derivatives

#25)  $f(x) = \frac{x^2}{x-3}$



# Graphing & Basic Optimization

## 5.1A – Graphing Using Derivatives

### Answers

- #1) positive  $(-\infty, -2) \cup (0, \infty)$  negative  $(-2, 0)$
- #2) positive  $(0, 4)$ , negative  $(-\infty, 0) \cup (4, \infty)$
- #3) c
- #4) a
- #5) d
- #6) b
- #7) 1<sup>st</sup> derivative cv: -4, 4                      2<sup>nd</sup> derivative cv:
- #8) 1<sup>st</sup> derivative cv: -1, 5                      2<sup>nd</sup> derivative cv:
- #9) 1<sup>st</sup> derivative cv: -4, 0, 1                      2<sup>nd</sup> derivative cv:
- #10) 1<sup>st</sup> derivative cv: 3                              2<sup>nd</sup> derivative cv:
- #11) 1<sup>st</sup> derivative cv: none                        2<sup>nd</sup> derivative cv:
- #12) 1<sup>st</sup> derivative cv:  $-1, \frac{1}{3}$                       2<sup>nd</sup> derivative cv:

#13) - #25) Use calculator to check your graphs.