

Name: \_\_\_\_\_

Complete the following problems to the best of your ability. Clearly number each question, and write your name on each sheet of paper you turn in. Algebraic support must be shown to receive full credit (i.e. show work!). Answers should be exact unless otherwise specified.

**Problem 1** Given the following functions, complete the following table. (**Curve Sketching: 4.1-4.3**)

(a)  $f(x) = [x + 2] / [x - 2]$

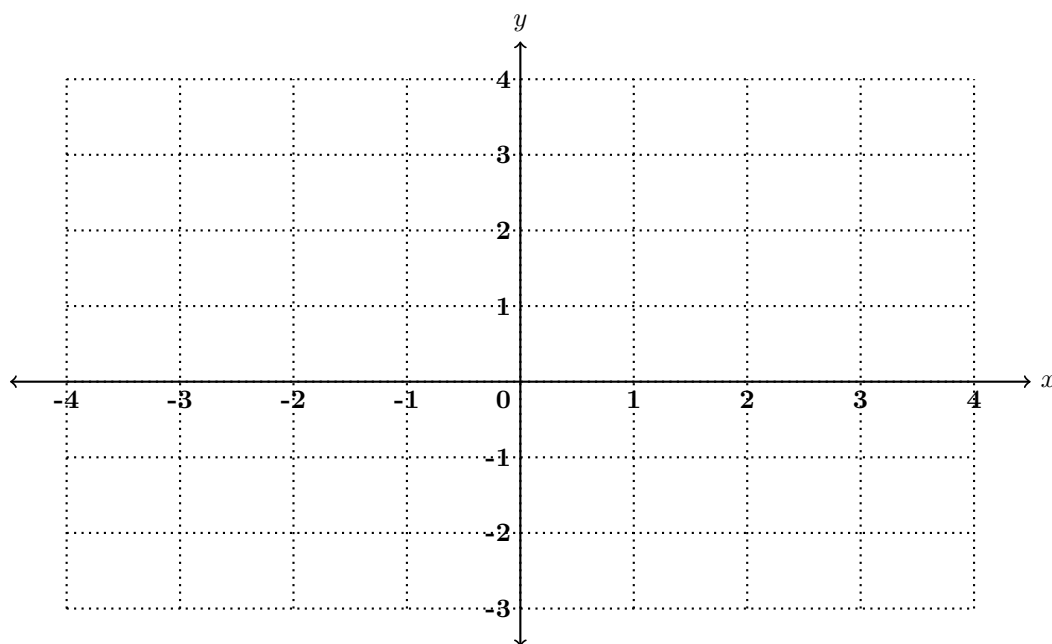
Domain	$x$ -intercept	$y$ -intercept	End behavior	Horizontal Asymptotes
Vertical Asymptotes	Increasing	Decreasing	Relative max(s)	Relative min(s)
Concave up	Concave down	Inflection points		

(b)  $g(x) = (3x + 1)(x + 4)(x - 2) = 3x^3 + 7x^2 - 22x - 8$

Domain	$x$ -intercept	$y$ -intercept	End behavior	Horizontal Asymptotes
Vertical Asymptotes	Increasing	Decreasing	Relative max(s)	Relative min(s)
Concave up	Concave down	Inflection points		

**Problem 2** Sketch a graph given the following properties (**Curve Sketching: 4.1-4.3**):

Domain	$x$ -intercept	$y$ -intercept	End behavior	Horizontal Asymptotes
$(-\infty, \infty)$	$x = -2, 1, 3$	$y = 2$	$\swarrow \quad \nearrow$	none
Vertical Asymptotes	Increasing	Decreasing	Relative max(s)	Relative min(s)
none	$(-\infty, 0) \cup (2, \infty)$	$(0, 2)$	$(0, 2)$	$(2, -3)$
Concave up	Concave down	Inflection points		
$(1, \infty)$	$(-\infty, 1)$	$(1, 0)$		



**Problem 3** Simplify (**Exponential/Logs review: 5.1, 5.2**)

(a)  $\ln \frac{(x+1)^2(x+3)^3}{\sqrt{x+4}}$

(b)  $\frac{5^0}{(2^{-3}x^{-2}y^2)^2}$

**Problem 4** Find the derivative (**Exponential/Log derivatives: 5.4, 5.5**)

(a)  $(x^2 + 1)e^{-x^2}$

(b)  $t^2 \ln \sqrt{x^2 - 4}$

**Problem 5** A wooden beam has a rectangular cross section of height  $h$  in. and width  $w$  in. (see accompanying figure). The strength  $S$  of the beam is directly proportional to its width and the square of its height. What are the dimensions of the cross section of the strongest beam that can be cut from a round log of diameter 24 in.? *Hint:  $S = kh^2w$  where  $k$  is a constant of proportionality.* (**Optimization II: 4.4, 4.5.** See additional geometrical problems in 4.5 for more practice)

