Name: \_\_\_\_

Solve the following equations for *x* or state that none exist.

1. 
$$5e^{x} - 2 = 0$$
  
2.  $5e^{x} + 4 = 0$   
3.  $5\ln(x) - 6 = 0$   
4.  $5\ln(x) + 7 = 0$ 

This page contains information and techniques you will need for Sections 4.5 and 4.6.

1. Write in your own words how to find the critical numbers of a function f(x) and why they are important.

2. Draw a graph of a function f(x) with domain (-∞,∞) such that
(i) f'(a) = f'(b) = 0 and f'(c) is undefined, and
(i) f has a local minimum at x = a, a local maximum at x = c and neither at x = b.

3. Draw a graph of a function f(x) with domain  $(-\infty,\infty)$  such that

(a) 
$$f(x) < 0$$
 and  $f'(x) > 0$ .  
(b)  $f'(x) < 0$  and  $f''(x) > 0$ .

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4. For each function below, find (a) its domain and (b) all its critical points.

(a) 
$$f(x) = x^3 - 2x^2$$

(b) 
$$f(x) = x^{1/5}$$

(c) 
$$f(x) = \arctan(x)$$

(d) 
$$f(x) = \frac{x^2}{x^2 - 4}$$
 (Note:  $f'(x) = \frac{-8x}{(x^2 - 4)^2}$ .)

(e) 
$$f(x) = e^{(1-x)^2}$$

(f) 
$$f(x) = \sqrt{x^2 - 4}$$

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5. For each derivative below, determine the intervals for which that derivative is positive and negative.

(a) 
$$f'(x) = x^{-4/5}$$

(b) 
$$y'' = \frac{8(3x^2+4)}{(x^2-4)^3}$$

(c) 
$$g'(x) = 3x^2e^{2x} + 2x^3e^{2x}$$

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6. Write a formula for a function f(x) such that f(x) has asymptotes x = 1, x = 4 and y = 0.

7. Give an example of a graph with two different horizontal asymptotes.

8. Evaluate each limit below.

(a) 
$$\lim_{x \to 2^+} \frac{5}{x-2}$$
  
(b)  $\lim_{x \to 2^-} \frac{5}{x-2}$   
(c)  $\lim_{x \to 2} \frac{5}{x-2}$   
(d)  $\lim_{x \to \infty} \frac{5}{x-2}$   
(e)  $\lim_{x \to -\infty} \frac{5}{x-2}$   
(f)  $\lim_{x \to \infty} \left(8 + \frac{5}{x-2}\right)$   
(g)  $\lim_{x \to \infty} \left(x + \frac{5}{x-2}\right)$