

### Some Sample Problems for Exam 1

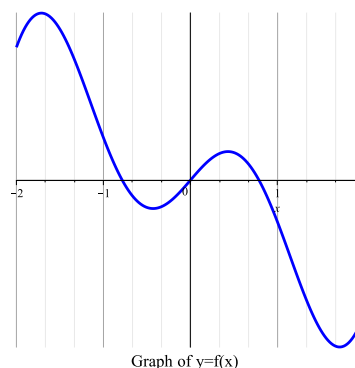
These are only a *few* sample problems to *help* you prepare for the exam. You should also be certain that you completely understand the WeBWorK assignments, Problems Sets, Reading Assignments, in-class work, and your class notes.

1. Let  $f(x) = \frac{x^2 - 5x + 6}{3x^2 - 3x - 6}$

- (a) Where is  $f$  continuous? Give your answer in interval notation.
- (b) Does  $f$  have any vertical asymptotes? If so, where? What is the behavior of  $f$  near the asymptote(s)?
- (c) Does  $f$  have any horizontal asymptotes? If so, where? What is the behavior of  $f$  near the asymptote(s)?

2. The graph of  $y = f(x)$  is shown to the right.

- (a) Sketch the graph of  $y = f'(x)$ .
- (b) Suppose  $F(x)$  is a function where  $F'(x) = f(x)$ .  
Sketch the graph of  $y = F(x)$ .



- Find the exact solutions to the equation  $e^{3x} \ln(x + 2) - 7e^{3x} = 0$
- Find all solutions to  $2 \cos(\theta)^2 - \cos(\theta) - 1 = 0$  that lie in the interval  $[0, 2\pi)$ .
- Show that  $f(x) = -2x^3 + 4x^2 + 10x + 3 \cos(x) - 12$  has a local minimum value between  $x = -2$ , and  $x = 0$ , and approximate the  $x$ -value where the minimum occurs accurate within 0.2 of its exact value.
- Use the definition of the derivative to find  $f'(3)$  if  $f(x) = 5x^2 - 2x$ .
- Find equation of the line tangent to  $y = 8x^3 - \frac{12}{x^2} + 3e^x$  at  $x = 1$ .
- The height  $H$ , in feet above ground, of the Hood blimp is recorded  $t$  hours after 12:00 noon on Sunday, September 24, and is given by  $H(t) = t^5 - 7t^4 - 5t^3 + 75t^2$ 
  - (a) What are the units of  $H'(t)$ ?
  - (b) Is the blimp rising or falling at 1:00 pm? At what rate?  
Also determine if the blimp is accelerating or decelerating at 1:00 pm and the rate.
  - (c) Repeat (b) for 2:00 pm and 4:00 pm.