

1. Many of the mistakes which Calculus students make (and therefore many of the points lost on quizzes and tests) are a result of algebraic errors. The purpose of this problem set is to remind you of certain algebraic properties so that you will use these properties correctly throughout the semester.

Decide whether each of the following is true or false. In either case, justify your answer with an explanation or a numerical example. If a statement is false, what would the correct statement be?

(a)  $\sqrt{x^2 + 9} = x + 3$

(b)  $(\ln x)^3 = 3 \ln x$

(c)  $\frac{3x^2(x+5) - x^3}{(x+5)^2} = \frac{3x^2 - x^3}{x+5}$

(d)  $\frac{\sin 2x}{2} = \sin x$

(e)  $\frac{x}{\sqrt{x}} = \sqrt{x}$

(f) If  $x^2 \leq 9$ , then  $x \leq \pm 3$ .

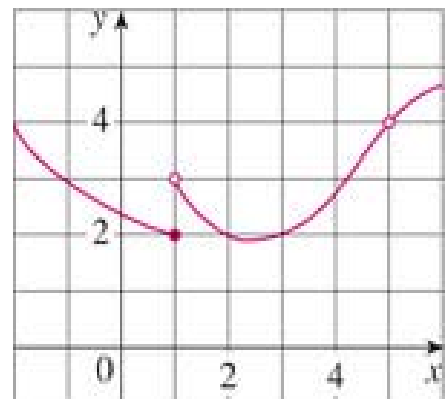
(g)  $\cos(\alpha + \beta) = \cos \alpha + \cos \beta$

(h)  $\sin^{-1} x = \frac{1}{\sin x}$

2. Given  $f(x) = 5x^2 - 6x + 3$ , find the simplified difference quotient,  $\frac{f(x+h) - f(x)}{h}$ ,  $h \neq 0$ .

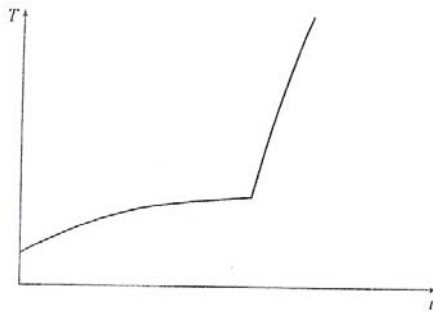
3. The entire graph of a function  $f$  is given.

- (a) State the domain of  $f$ .
- (b) Estimate the value of  $f(1)$ .
- (c) For what value(s) of  $x$  is  $f(x) = 4$ ?
- (d) On what interval is  $f$  decreasing?

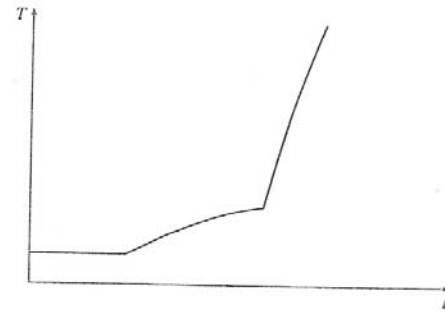


4. One of the skills you will be learning in this course is the ability to take a description of a real-world occurrence, and translate it into mathematics. Conversely, given a mathematical description of a phenomenon, you will learn how to describe what is happening in plain language. Here follow four graphs of temperature versus time and three stories. Match the stories with the graphs. When finished, write a similar story that would correspond to the final graph.

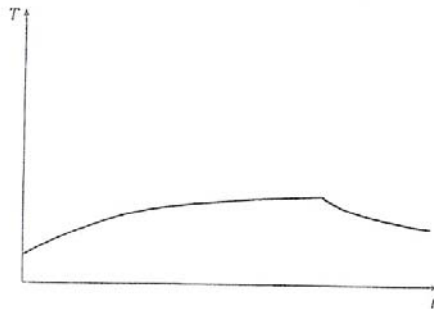
- (a) I took my chicken out of the freezer at noon and left it on the counter to thaw. Then I cooked it in the oven when I got home.
- (b) I took my chicken out of the freezer this morning and left it on the counter to thaw. Then I cooked it in the oven when I got home.
- (c) I took my chicken out of the freezer this morning, and left it on the counter to thaw. I forgot about it and went out for Chinese food on my way home from work. I put it in the refrigerator when I finally got home.



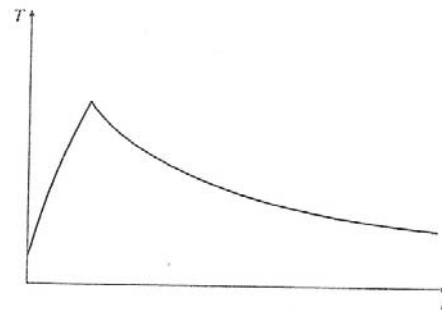
Graph 1



Graph 2



Graph 3



Graph 4

5. Solve algebraically:

(a)  $\frac{2x-5}{x+3} \geq 0$

(b)  $2 \sin^2(x) - 1 = 0, 0 \leq x \leq 2\pi$