

Show your work in the space provided. At most half-credit is given when work is not shown. If you use a graphical technique, sketch the graph on the test paper. This “sample test” has 9+2 problems in 4 pages (the actual test will have fewer problems). Relax and do your best.

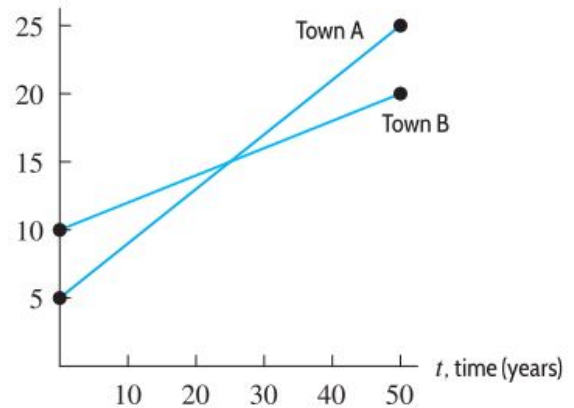
1. (12 pts) The figure below gives the population (in thousands of people) of two different towns from the year 1950 to the year 2000. Variable t is years elapsed since 1950.

- (a) Compute average rate of change for population in each town from $t = 0$ to $t = 50$; include units in each answer.

Town A:

Town B:

P , population (in 1000s)



- (b) (2 pts) Which town is growing faster? Circle one: Town A Town B
- (c) (2 pts) Which town starts with the most people? Circle one: Town A Town B
- (d) In which year will the two towns have the same population? _____

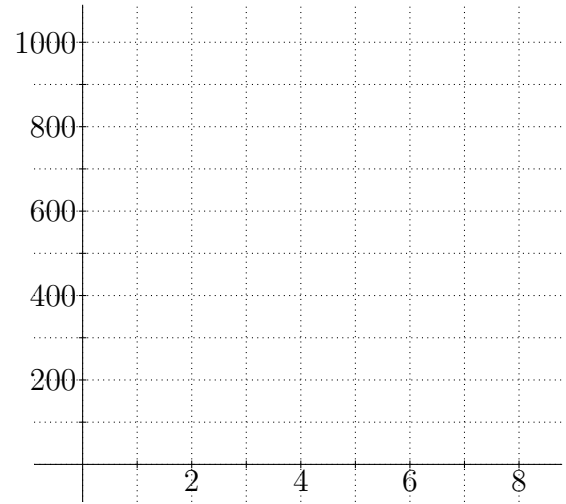
What will the population be at that time? _____

2. (8 pts) Consider the function $R(t)$ given by the table

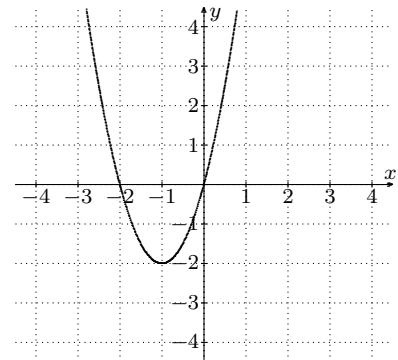
t	1.5	2.4	3.6
$R(t)$	-5.7	-3.1	-1.4

- (a) (2 pts) Is $R(t)$ a decreasing function? Explain your answer.
- (b) (6 pts) Calculate two average rates of change, then use that information to help identify whether $R(t)$ is concave up or concave down.

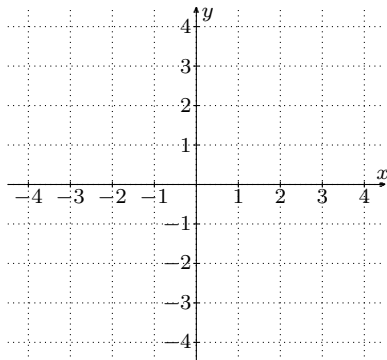
3. (12 pts) Let $C(x)$ be the cost of going heli-skiing for x hours in a single day. For 2 hours of heli-skiing or less the cost is \$300. After 2 hours, there is an additional refueling charge of \$150 and additional hours cost \$100 per hour. The maximum hours of skiing the company allows in one day is 7 hours. Give formulas for this piecewise function $C(x)$ and graph it. Label axes.



4. (10 pts) Let $f(x) = 2x^2 + 4x$, its graph is given here. \rightarrow



- (a) (4 pts) Graph $g(x) = f(x - 1)$ in the grid shown below.



- (b) (6 pts) Compute a formula for $f(x - 1)$. Simplify.

5. (12 pts) The area, $A = f(d)$, in in^2 of a circular pizza is a function of the diameter d , in inches. The cost, $C = g(A)$, in dollars of adding pepperoni to a pizza is a function of the area A . A package of pepperoni costs \$3 and covers 250 square inches of pizza. (The area A of a circle of radius r is given by $A = \pi r^2$.)

(a) Find $f(16)$. Give units.

(b) Find $g(200)$. Give units.

(c) Interpret $g(f(12)) = 1.36$. (Write a complete sentence; include units.)

(d) Find $g^{-1}(1.50)$. Give units.

6. (8 pts) Use a graph to find the range of the function on the given domain:

$$f(x) = x^2 - 4, \quad -2 \leq x \leq 3$$

7. (14 pts) The cost, C , in thousands of dollars, of producing q lb of an alloy is given by

$$C = f(q) = 250 + 0.7q.$$

(a) Find **and** interpret $f(10)$.

(b) Find a formula for $f^{-1}(C)$.

$f^{-1}(C) =$

(c) Find **and** interpret $f^{-1}(257)$.

8. (8 pts) Let $V = f(t)$ be the speed in km/hr of an accelerating car t seconds after starting. Interpret the inverse function $f^{-1}(V)$ and describe its units.

9. (12 pts) Consider the function $f(x) = 2x^2 - 4x - 30$.

(a) Write $f(x)$ in *vertex form*, i.e., find numbers a, h, v such that $f(x) = a(x - h)^2 + v$.

(b) Factor $f(x)$ completely.

(c) Show work which solves $f(x) = 8$.

10. Factor, find the zeros (horizontal intercepts), and graph the following functions.

(a) $h(t) = -16t^2 + 32t$

(b) $p(x) = -x^2 + 3x + 10$

11. (a) Complete the square to solve $2z^2 - 20z + 10 = 0$

(b) Use the quadratic formula to solve $-x^2 + 3x + 9 = 0$