Math 173
Prof. Ruffo **Final Exam Review** **Fall 2007**

Chapter 1

(1) For each function below, find the domain f. Find formulas for the following functions, and state their domains:
- f^{-1},
- the function obtained by shifting the graph of f to the right by c units,
- the function obtained by shifting the graph of f to the left by c units,
- the function obtained by shifting the graph of f up by c units,
- the function obtained by shifting the graph of f down by c units,
- the function obtained by stretching the graph of f vertically by c units,
- the function obtained by stretching the graph of f horizontally by c units,
- the function obtained by compressing the graph of f vertically by c units,
- the function obtained by compressing the graph of f horizontally by c units,
- the function obtained by reflecting the graph of f about the x-axis,
- the function obtained by reflecting the graph of f about the y-axis,

(a) $f(x) = \sqrt{4x-1}$.
(b) $f(x) = \sin(1/x)$.
(c) $f(x) = \frac{3x-1}{2x+5}$.
(d) $f(x) = \frac{x^2-1}{x^2+4x+3}$
(e) The function whose graph is the top half of the parabola $x-1+(y-2)^2 = 0$.
(f) The function whose graph is the bottom half of the parabola $x-1+(y-2)^2 = 0$.
(g) The function whose graph is the top half of the ellipse $4x^2-1+(y-2)^2 = 0$.
(h) The function whose graph is the bottom half of the ellipse $4x^2-1+(y-2)^2 = 0$.

(2) Suppose f is an even function and g and h are odd functions. Which of the following functions are even?

I. $f \circ g$ II. $g \circ f$ III. $f \cdot g$ IV. $g \cdot h$

(3) Which of the following function are exponential?

I. $f(x) = e^x$ II. $g(u) = u^x$ III. $h(t) = t^5 - t^4 + t^3 + 1$

(4) What do all members of the family of linear functions $f(x) = 3 - m(x-1)$ have in common? Sketch several members of this family.

(5) You scream in the middle of a very large, flat desert. The sound of your voice travels outward at a speed of 344 meters per second, creating an expanding circle inside of which your screaming is heard.
(a) Express the radius r of this circle as a function of time (in seconds).
(b) Find a formula for the area A of this circle as a function of the radius r.
(c) Find a formula for $A \circ r$ (as a function of time) and interpret it.

(6) Consider the function $f(x) = \frac{1}{1-2^x}$.
(a) What is the domain of f?

(b) Find a formula for the function g obtained by shifting the graph of f two units to the right.
(c) What is the domain of g?
(d) Find a formula for the function h obtained by reflecting the graph of f about the x-axis.
(e) What is the domain of h?

(7) Under ideal conditions a certain bacteria population is known to double every 3 hours. Suppose that there are initially 50 bacteria.
(a) What is the population after 12 hours? After 15 hours?
(b) What is the population after t hours?
(c) Express the population after t hours in the form $p(t) = Ce^{rt}$, *i.e.*, find C and r.

> Jim leaves Oneonta and $5:00$ PM and drives at a constant speed along $I-88$. He arrives in Binghamton, 57 miles from Oneonta, at $5:50$ PM.

(8) Find a formula for the function which describes Jim's distance d from Oneonta as a function of time t?
(9) What does the slope of the graph represent?
(10) Find a formula for the function obtained by shifting the graph of $f(x) = x^3$ two units up and three units to the right.

> Milhouse receives $\$30$ from his parents for each point above 70 he gets on his Calculus exam. He goes to Belgium for Thanksgiving break, and converts the money he received to euros, at an exchange rate of 0.74 euros to a dollar.

(11) Find a formula for the amount of money Milhouse receives in dollars, d, as a function of his exam score, s? Assume that the domain is the interval $[70, 100]$.
(12) Find a formula for the amount of money (e, in euros) Milhouse has upon changing currency in Belgium as a function of the money d given him by his parents (in dollars)?
(13) Let f be the function you chose in problem 10 and g the function you chose in problem 11. Which of the following functions describes the amount of money in euros that Milhouse starts out with in Belgium as a function of his exam score?
(14) Find a formula for the inverse of the function $f(x) = \frac{2^x}{3+2^x}$.
(15) The graph of f is obtained from the graph of f^{-1} by what transformation of the plane?
(16) If a rock is thrown upwards on Mars with a velocity of $10 m/s$, its height in meters t seconds later is given by the following table:

t (seconds)	0	1	2	3	4	5
h (meters)	0	8.14	12.56	13.26	10.24	3.50

What is the average velocity for the time interval $[1,4]$?

(17) A certain ferris wheel has a radius of 50 meters and its center is 52 meters above the ground. Suppose that you get on the ferris wheel at the closest point to the ground, and at time $t = 0$ it begins to revolve at a rate of one full revolution every minute. Let $f(t)$ be your height in meters as a function of time t in seconds.
  (a) Find a formula for f as a function of t.
  (b) Suppose that the ferris wheel revolves at a rate of one full revolution every 2 minutes. Find a formula for f, and explain the relation between the graph of this function and the graph of the function you obtained in part a.

(18) Consider the function $f(x) = \frac{1}{2-x}$.
  (a) Find the slope of the secant line through the points $(0, f(0))$ and $(1, f(1))$.
  (b) Find the slope of the secant line through the points $(0, f(0))$ and $(0.1, f(0.1))$.
  (c) Find the slope of the secant line through the points $(0, f(0))$ and $(0.01, f(0.01))$.
  (d) Using your answers to the previous parts, approximate the slope of the tangent line to the graph of f at $x = 0$.
  (e) Using your answer from part d, find the equation of the tangent line to the graph of f at $x = 0$.

(19) Define what it means for a function f to be odd without mentioning the graph of f.

(20) Suppose f and g are both odd. Prove that $f \circ g$ is odd or give a counterexample.

(21) Suppose f is even and g is odd. Prove that $f \circ g$ is odd or give a counterexample.

(22) Simplify the expression $\sin(\cos^{-1} x)$. Your answer should be an algebraic function of x.

(23) Simplify the expression $\cos(\sin^{-1} x)$. Your answer should be an algebraic function of x.

(24) Simplify the expression $\sec(\cos^{-1} x)$. Your answer should be an algebraic function of x.

(25) Simplify the expression $\cot(\sin^{-1} x)$. Your answer should be an algebraic function of x.

(26) What are the equations of the vertical asymptotes of the function $F(x) = \frac{x^2-x-2}{x^2-1}$?

Chapter 2

(1) Evaluate the limit, if it exists. If it does not exist, explain why not.
  (a) $\lim_{t \to 16} \frac{16-t}{\sqrt{t}-4}$
  (b) $\lim_{h \to 0} \frac{\sqrt{4-h}-2}{h}$
  (c) $\lim_{x \to 0} \left(\frac{1}{x} - \frac{13}{x^2+13x}\right)$
  (d) $\lim_{h \to 0} \frac{\sqrt{9+h}-3}{h}$
  (e) $\lim_{x \to 1} \frac{x^2-1}{|3x-3|}$
  (f) $\lim_{u \to 2} \frac{u^3+2u^2-8u}{u^2-u-2}$

(2) Precisely state *in complete sentences* the ϵ-δ definition of the limit.
(3) Use the definition to prove that $\lim_{x\to 1}(x+1)=2$.
(4) Use the definition to prove that $\lim_{x\to 1}(7x+3)=10$.
(5) Use the definition to prove that $\lim_{x\to 1}(1/x)=1$.
(6) Use the definition to prove that $\lim_{x\to 1}(1/2x)=1/2$.
(7) Use the definition to prove that $\lim_{x\to 1}(x^2+1)=2$.
(8) Use the definition to prove that $\lim_{x\to 0}(2x^2+12)=12$.
(9) Use the definition to prove that $\lim_{x\to 5}(17x-23)=62$.
(10) Use the definition to prove that $\lim_{x\to 0}(x^2+5)=5$.
(11) Find $\delta>0$ and $a\in(-\pi/2,\pi/2)$ such that $|x-a|<\delta$ implies that $|\tan x-1|<0.1$.
(12) State precisely what it means for a function to be continuous at a point a.
(13) Find $c\in\mathbb{R}$ such that the function

$$g(x)=\begin{cases} 2cx-x+3, & x<3\\ cx-x^3, & x\geq 3\end{cases}$$

is continuous at $x=3$.
(14) Find all values of the constant c such that the function

$$g(x)=\begin{cases} x+c, & x<-1\\ cx^2-2c, & x\geq -1\end{cases}$$

is continuous on $\mathbb{R}$.
(15) Sketch the graph of a function which is:
- continuous everywhere except at 1 and 5,
- continuous from the left at 1, and
- not continuous from the left nor the right at 5.

(16) For which values of a does the limit $\lim_{x\to -2}\frac{-x^2+ax+a+3}{x^2+x-2}$ exist, and what is the corresponding value L of the limit?
(17) Find an interval on which the equation $x^3+\frac{35}{4}x=6x^2+3$ has a root.
(18) Precisely state the Squeeze Theorem.
(19) Use the Squeeze Theorem to evaluate $\lim_{u\to 4}(u^2-4u+4)\cos(\frac{2\pi}{u-4})$.
(20) Use the Squeeze Theorem to evaluate $\lim_{x\to -1}(x^2+2x+1)\cos(\frac{1}{x+1})$.
(21) Use the Squeeze Theorem to prove that $\lim_{x\to 0^+}x\cos(\sin\frac{1}{x})=0$.
(22) In order to use the Squeeze Theorem to evaluate $\lim_{x\to 0}x^3|\cos(\pi/x)|$, one needs to find functions f and h such that $f(x)\leq x^3|\cos(\pi/x)|\leq h(x)$. What function could h be?
(23) In order to use the Squeeze Theorem to evaluate $\lim_{x\to 0}3x^2\cos(1/x)$, one needs to find functions f and h such that $f(x)\leq 3x^2\cos(1/x)\leq h(x)$. Find such a function f.

(24) Find an inequality of the form $|x - a| < \delta$ which ensures that $|\sqrt{x} - 1/2| < 0.01$.

(25) What does the statement "For all $\epsilon > 0$ there exists $N < 0$ such that if $x < N$ then $|f(x) - M| < \epsilon$" mean?

(26) Verify that the point $P = (1, 2/5)$ lies on the curve given by the equation $y = x/(2+3x)$. Let $Q(x, 2x/2+3x)$.
   (a) Find the slope of the secant line through the points P and Q.
   (b) Write the slope of the tangent line to the curve at $x = 1$ as a limit.
   (c) Using your answer to part **b**, find the slope of the tangent line at P.
   (d) Find the equation of the tangent line.

(27) State precisely what it means for a function f to have the line $y = L$ as a horizontal asymptote.

(28) Using the definition, find *all* horizontal asymptotes of the function $f(x) = \frac{\sqrt{11x^2-25x+600}}{23x+2}$.

(29) Find the equations of the vertical asymptotes of the function $F(x) = \frac{x^2+1}{x^2-1}$.

(30) Find the limit lim $\lim_{u \to 1} \frac{u^3-6u^2+11u-6}{u^2-5u+4}$, if it exists.

(31) Find the limit lim $\lim_{h \to 0} \frac{\sqrt{4+h}-2}{h}$, if it exists.

(32) Find $c \in \mathbb{R}$ such that the function $g(x) = \begin{cases} cx^2 - 1, & x < 3 \\ c + x, & x \geq 3 \end{cases}$ is continuous at $x = 3$.

(33) Which limit laws are needed to show that a polynomial is continuous?
   I. $\lim_{x \to a} \left(\frac{f(x)}{g(x)}\right) = \frac{\lim_{x \to a} f(x)}{\lim_{x \to a} g(x)}$
   II. $\lim_{x \to a} (f(x)g(x)) = \lim_{x \to a} f(x) \lim_{x \to a} g(x)$
   III. $\lim_{x \to a} (f(x)^n) = (\lim_{x \to a} f(x))^n$
   IV. $\lim_{x \to a} (f(x) + g(x)) = \lim_{x \to a} f(x) + \lim_{x \to a} g(x)$
   V. $\lim_{x \to a} (cf(x)) = c \lim_{x \to a} f(x)$

(34) For which values of a does the limit $\lim_{x \to -2} \frac{3x^2+ax+a+3}{x^2+x-2}$ exist, and what is the corresponding value of the limit?

(35) Find an interval on which the equation $x^4 + 5x^2 + 5x = 5x^3 + 6$ has a root.

(36) What is the slope of the tangent line to $y = 1/\sqrt{x}$ at the point $(1/9, 3)$?

(37) Find the equation of the tangent line to $y = 1/\sqrt{x}$ at the point $(1/9, 3)$.

(38) The points $P(1, 1/3)$ and $Q(2, 2/5)$ lie on the curve given by the equation $y = x/(1+2x)$.
   (a) Find the equation of the secant line through the points P and Q.
   (b) Write the slope of the tangent line to the curve at $x = a$ as a limit.
   (c) Using your answer to part **b**, compute the slope of the tangent line at P.
   (d) Find the equation of the tangent line.

(39) For which values of ξ is the function

$$f(x) = \begin{cases} x^2 - 19\xi \sin x + 2\xi, & x \leq 0 \\ \xi(x+1)^3 - \sqrt{x+4}, & x > 0 \end{cases}$$

continuous?

(40) State precisely what it means for a function f to have the line $y = L$ as a horizontal asymptote.

(41) Using the definition, find *all* horizontal asymptotes of the function $f(x) = \frac{x^3 - 25x + 132454356}{\sqrt{23 + x^6}}$. Show all your work.

(42) State precisely what is means for a function f to have the line $x = a$ as a vertical asymptote.

(43) Find all vertical asymptotes of the function $b(x) = \frac{x+1}{x^2+4x+3}$. Show your work.

(44) Find all vertical asymptotes of the function $c(x) = \frac{x^2+4x+3}{x^3+7x^2+15x+9}$. Show your work.

(45) Evaluate the limit $\lim_{t \to 0} \left(\frac{1}{t\sqrt{4+t}} - \frac{1}{2t} \right)$, if it exists. If it does not exist, explain why.

Chapter 3

(1) Give a precise statement of each rule.
- Power rule.
- Quotient rule.
- Product rule.
- Constant multiple rule.
- Chain rule.

(2) Differentiate the function. It should not be necessary to use the chain rule. If the function is a trigonometric function, differentiate it using what you know about the derivative of the sine and cosine functions combined with the quotient rule.
- (a) $g(t) = 27t + 12$
- (b) $s(\phi) = \sin \phi$
- (c) $c(\phi) = \cos \phi$
- (d) $t(\phi) = \tan \phi$
- (e) $s(\phi) = \sec \phi$
- (f) $c(\phi) = \csc \phi$
- (g) $t(\phi) = \cot \phi$
- (h) $f(x) = xe^x + 2x \sin x$
- (i) $s(\phi) = x \sin \phi \cos \phi$
- (j) $G(x) = \ln(xe^x)$

(3) Differentiate the function. You will need to use the chain rule. If the function is the inverse of a trigonometric function, work it out directly (as we did in class) – *do not* just look up the answer in the book.
- (a) $s(\phi) = \sin^{-1} \phi$
- (b) $c(\phi) = \cos^{-1} \phi$
- (c) $t(\phi) = \tan^{-1} \phi$
- (d) $c(\phi) = \csc \sqrt{\phi}$

(e) $c(\phi) = \sqrt{\csc\phi}$
(f) $f(t) = \sqrt{t^2 + 4t + 4}$
(g) $f(t) = \frac{\sqrt{t^2+4t+4}}{t}$
(h) $a(t) = \sec(27t + 12)$
(i) $f(x) = e^{x^2+1}$
(j) $f(x) = e^{x^2} + 1$
(k) $f(x) = (e^x)^2 + 1$
(l) $f(x) = xe^{x^2+1}$
(m) $f(x) = x^2e^{x^2} + 1$
(n) $f(x) = \sin x \cdot e^{2x+1}$
(o) $m(v) = m_0\frac{1}{\sqrt{1-v^2/c^2}}$
(p) $x(t) = \frac{(t-1)^4(t+1)^2}{e^t(t+3)^6}$
(q) $f(x) = x^{e^x}$

(4) Find the limit $\lim_{\theta\to 0} \frac{\sin 3\theta}{\sin 2\theta}$, if it exists.
(5) Find the equation of the tangent line to the curve $y = \ln xe^x$ at the point $(1, 1)$.
(6) Find the equation of the tangent line to the curve $(x^2 + y^2)^2 = x(x - 3y^2)$ at the point $(-1/2, 1/2)$.
(7) Is the function in problem 12 differentiable at $x = 0$? Justify your answer.
(8) A curve passes through the point $(0, 7)$ and has the property that the slope at every point P on the curve is 3 times the y-coordinate of P. What is the equation of the curve?
(9) If \$700 is borrowed at an annual interest rate of 7%, find the amount due after 3 years if the interest is compounded (1). annually, (2). quarterly (3). monthly and (4). continuously.
(10) Neptunium has a half-life of 2.355 days. Express the amount of an initial sample that is left after t days as a function of t. How long does it take for 3% of the initial sample to be left? How much of the initial sample is left after 10 days?
(11) The shallow end of a pool is 3 feet deep and the depth increases linearly to 10 feet at the deep end, 30 feet from the shallow end. The pool is 15 feet wide. Suppose that the pool is being drained at a rate of 10 cubic feet per minute. How fast is the water level decreasing when there is 4 feet of water at the deep end?
(12) Two people start at the same point. One walks Southwest at 2 miles per hour and the other walks Northwest at 3 miles per hour. How fast is the distance between them changing:
(a) When they are 1 mile apart?
(b) After 25 minutes?
(c) When the person walking Northwest is 6 miles away from where she started?
(d) Same as the previous problem, with "Northwest" replaced by "North".
(13) Find the differential and linearization of each function in problems **6** through **18**.
(14) Approximate the given numbers using differentials or a linear approximation.

(a) $(4.001)^5$
(b) $\sqrt{122}$
(c) $\sin 1^\circ$

Chapter 4

(1) Precisely state:
   (a) Theorems:
      (i) Fermat's Theorem
      (ii) Rolle's Theorem
      (iii) Mean Value Theorem
      (iv) First derivative test
      (v) Second derivative test
   (b) Definitions:
      (i) Local maximum/minimum
      (ii) Critical number
      (iii) Antiderivative
      (iv) Inflection point
(2) Find all critical numbers of the given function
   (a) $f(x) = 2x + 7$
   (b) $f(x) = |2x + 7|$
   (c) $f(x) = 4x^2 + 28x + 49$
   (d) $f(x) = x^3 - 2x + 1$
   (e) $f(x) = x^3 - 3x^2 + 6x + 1$
   (f) $f(x) = \frac{4x^2+28x+49}{2x+7}$
   (g) $f(x) = \frac{2x+7}{4x^2+28x+49}$
   (h) $f(x) = \sin x$
   (i) $f(x) = \csc x$
   (j) $f(x) = \cos x - x$
   (k) $f(x) = xe^{x^2}$
   (l) $f(x) = 2x^{1/5} - x^{2/5}$
(3) Find the absolute maximum and minimum values of the given function on the given interval using the closed interval method.
   (a) $f(x) = 2\cos x + \sin 2x$, $[0, \pi/2]$
   (b) $f(x) = (x^2 - 4)^3$, $[-3, 3]$
   (c) $f(x) = (x^2 - 4)^3$, $[1, 2]$
   (d) $f(x) = x - 2\ln x$, $[1, 3]$
   (e) $f(x) = \ln(x^2 + x + 1)$, $[-1, 1]$
   (f) $f(x) = \frac{(x-1)^3}{x^2-4}$, $[-3, 3]$
   (g) $f(x) = x^3 - 6x^2 + 11x - 6$, $[0, 4]$
(4) Let $f(x) = |2x - 1|$. Show that $f(0) = f(1)$, but there is no number $c \in (0, 1)$ such that $f'(c) = 0$. Why does this not contradict Rolle's Theorem?

(5) Let $f(x) = \sqrt[3]{8x} - 2$. Show that $f(-1) = f(1)$, but there is no number $c \in (-1, 1)$ such that $f'(c) = 0$. Why does this not contradict Rolle's Theorem?

(6) Let a and b be positive real numbers. Find all critical numbers of the function $f(x) = \frac{x^a}{(1-x)^b}$.

(7) For each function in Problem ??, check whether the function satisfies the hypotheses of the Mean Value Theorem on the given interval. If it does, find all numbers c which satisfy the conclusion of the theorem.

(8) Let $f(x) = x^{-3}$. Show that there is no number $c \in (-1, 1)$ such that $f(1) - f(-1) = f'(c)(1 - (-1))$. Why does this not contradict the Mean Value Theorem?

(9) Show that the equation $2 + 2x + x^3 + 3x^5$ has exactly one real root.

(10) Show that the equation $x^3 = -1$ has exactly one real root.

(11) Show that the equation $x^4 + 4x + c$ has at most 2 real roots.

(12) Show that the equation $x^5 = -1$ has exactly one real root.

(13) Show that the equation $x^6 + 6x + c$ has at most 2 real roots.

(14) Show that the equation $x^7 = -1$ has exactly one real root.

(15) Show that the equation $x^8 + 8x + c$ has at most 2 real roots.

(16) Show that a polynomial of degree 3 has at most 3 real roots.

(17) Show that a polynomial of degree 4 has at most 4 real roots.

(18) Show that a polynomial of degree 5 has at most 5 real roots.

(19) Use the mean value theorem to show that the inequality $|\sin a - \sin b| \leq |a - b|$ holds for all $a, b \in \mathbb{R}$.

(20) Use the mean value theorem to show that the inequality $\tan a - \tan b \geq a - b$ holds for all $a, b \in \mathbb{R}$.

(21) A monk leaves the monastery at 7am Friday morning and arrives at the top of the mountain at 7pm that evening. He begins to make his way back down the mountain along the same path at 7am Saturday morning, arriving at the monastery at 7pm that evening. Show that at some time on both days, the monk was walking at the same speed.

(22) For each function in Problems ?? and ??, do the following:
   (a) Find the vertical and horizontal asymptotes.
   (b) Find the intervals of increase and decrease.
   (c) Find the local maximum and minimum values.
   (d) Find the intervals of concavity and the inflection points.
   (e) Use this information to sketch the graph.

(23) For what values of a and b does the function $f(x) = bx + \cos ax$ have a maximum value of $f(3) = 1$?

(24) For what values of a and b does the function $f(x) = axe^{bx^2}$ have a maximum value of $f(2) = 1$?

(25) Suppose that the derivative of a function f is $f'(x) = (x-1)^2(x+2)^3(x-3)^5$. On what intervals is f increasing?

(26) Find the limit. Use L'Hospital's Rule where appropriate. If L'Hospital's Rule does not apply, explain why. If L'Hospital's Rule does apply, is there a more elementary method?

(a) $\lim_{x\to 1} \frac{x^2-1}{x^2-x}$
(b) $\lim_{x\to 2} \frac{x^2+x-6}{x-2}$
(c) $\lim_{x\to 1} \frac{x^a-1}{x^b-1}$
(d) $\lim_{\theta\to 0} \frac{\sin 3\theta}{\sin 5\theta}$
(e) $\lim_{t\to 0} \frac{e^{4t}-1}{t}$
(f) $\lim_{x\to\infty} \frac{x^5+3x^3+2x^2}{4x^5-3x+1}$
(g) $\lim_{x\to\infty} \left(1+\frac{a}{x}\right)^{bx}$

(27) A box with a square base and an open top must have a volume of $10m^3$. Find the dimensions of the box that minimize the amount of material used.

(28) If $10m^2$ of material is available to construct a box with a square base and no top, what is the largest possible volume?

(29) A steel drum with a circular base and an open top must have a volume of $10m^3$. Find the dimensions of the drum that minimize the amount of material used.

(30) If $10m^2$ of material is available to construct a steel drum with a circular base and no top, what is the largest possible volume?

(31) Find the point on the line $x - y = 3$ which is closest to:

(a) the origin.
(b) the point $(4, -1)$.
(c) the point $(8, 8)$.

(32) Find the dimensions of the rectangle of largest area that can be inscribed in a circle of radius r.

(33) Find the dimensions of the rectangle of largest area that can be inscribed in the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$.

(34) Find f.

(a) $f'(x) = 2 + x^2 + 3x^5$
(b) $f'(x) = 4\sin x + 2x$
(c) $f'(x) = \cos 4x$
(d) $f'(x) = \sqrt[3]{x}(2x^7+1)$
(e) $f'(x) = 5/\sqrt{x}, f(1) = 1$
(f) $f'(x) = x\cos(x^2)$
(g) $f''(x) = 2 + x^2 + 3x^5, f(0) = 0, f'(0) = 1$
(h) $f'''(x) = 2 + x^2 + 3x^5, f(0) = 0, f'(0) = 1, f''(0) = 2$
(i) $f''(x) = 4\sin x + 2x$
(j) $f''(x) = \cos 4x$
(k) $f''(x) = \sqrt[3]{x}(2x^7+1)$

(l) $f''(x) = 5/\sqrt{x}, f(1) = 1$
(m) $f'(x) = e^{3t} + 1, f(0) = 4$

(35) A car moving at 60ft/s applies its brakes, producing a constant deceleration of 20ft/s. What is the distance traveled before the car comes to a complete stop?

(36) A ball dropped from the top of a tower hits the ground at a speed of 35m/s. How tall is the tower?

(37) A particle is moving along a straight line with the given data. Find the position of the particle as a function of time t.
(a) $v(t) = \sin x - \cos x,\ s(0) = 0$
(b) $v(t) = \sin x - \cos x,\ s(0) = 3$
(c) $a(t) = \sin x - \cos x,\ s(0) = 0,\ v(0) = 0$
(d) $v(t) = 4t - 7,\ s(0) = 3$
(e) $a(t) = 4t - 7,\ s(0) = 3,\ v(0) = 0$
(f) $v(t) = 4t^2 - 7t,\ s(0) = -1$