## NAME:

- Find the quadratic approximating polynomial for  $f(x) = \sqrt{x}$ , centered at a = 4. (a) 10 pts.
  - Use the quadratic approximating polynomial to approximate  $\sqrt{3.88}$ . (b) |5 pts.
- 2. 10 pts. Use the remainder term to find a bound on the absolute error of the approximation

$$\sqrt{1+x} \approx 1 + \frac{x}{2}$$

on the interval [-0.12, 0.14].

Determine the interval of convergence of the power series.

(a) 
$$\sum \frac{(-1)^n n^2}{(n+1)!} (x+3)^n$$
 (b)  $\sum \frac{6^n}{\sqrt{n}} x^n$  (c)  $\sum \frac{(-1)^n}{n^2 3^n} (x-2)^n$ 

(b) 
$$\sum \frac{6^n}{\sqrt{n}} x^n$$

(c) 
$$\sum \frac{(-1)^n}{n^2 3^n} (x-2)^n$$

4. | 15 pts. | Find a power series representation centered at 0 for the function

$$f(x) = \ln \sqrt{1 - x^2},$$

and determine the interval of convergence of the series.

Find the first four nonzero terms of the binomial series centered at 0 for 5. 10 pts.

$$f(x) = (1+2x)^{3/4}.$$

Use Maclaurin series (see table on other side) to evaluate the limit 6. 10 pts.

$$\lim_{x \to 0} \frac{e^x - 1 - x}{x \arctan x}.$$

Approximate the value of the definite integral with an absolute error less than  $10^{-4}$ : 7. 10 pts.

$$\int_0^1 \sin \sqrt{x} \, dx.$$

8. 10 pts. Express the curve given by the parametric equations

$$x(t) = \sec t$$
,  $y(t) = \tan t$ ,  $0 \le t \le \pi/4$ 

by an equation in x and y (i.e. a Cartesian equation).

9. 10 pts. Find the slope of the curve given by parametric equations

$$x(t) = 4\sin 2t, \quad y(t) = 3\cos 2t$$

at the point corresponding to  $t = \pi/6$ .

## Maclaurin Series for Some Common Functions:

$$\frac{1}{1-x} = \sum_{n=0}^{\infty} x^n$$
, for  $|x| < 1$ 

$$e^x = \sum_{n=0}^{\infty} \frac{x^n}{n!}$$
, for  $|x| < \infty$ 

$$\sin x = \sum_{n=0}^{\infty} \frac{(-1)^n x^{2n+1}}{(2n+1)!}, \text{ for } |x| < \infty$$

$$\cos x = \sum_{n=0}^{\infty} \frac{(-1)^n x^{2n}}{(2n)!}, \text{ for } |x| < \infty$$

$$\ln(1+x) = \sum_{n=1}^{\infty} \frac{(-1)^{n+1}x^n}{n}, \text{ for } -1 < x \le 1$$

$$\tan^{-1} x = \sum_{n=0}^{\infty} \frac{(-1)^n x^{2n+1}}{2n+1}$$
, for  $|x| \le 1$ 

$$(1+x)^p = \sum_{n=0}^{\infty} \binom{p}{n} x^n$$
, for  $|x| < 1$ , where  $\binom{p}{n} = \frac{p(p-1)(p-2)\cdots(p-n+1)}{n!}$  and  $\binom{p}{0} = 1$ .

## Some Trigonometric Identities:

$$\sin 2\theta = 2\sin\theta\cos\theta$$

$$\cos 2\theta = \cos^2 \theta - \sin^2 \theta$$

$$\sin^2\theta = \frac{1 - \cos 2\theta}{2}$$

$$\cos^2 \theta = \frac{1 + \cos 2\theta}{2}.$$