1. **(1 pt) Library/FortLewis/Calc2/10-2-Taylor-series/Taylor-series-04.pg**
Find the first five terms of the Taylor series for the function $f(x) = \ln(x)$ about the point $a = 9$. (Your answers should include the variable x when appropriate.)

$\ln(x) =$ ______ + ______ + ______ + ______ + ______ + ...

2. **(1 pt) Library/FortLewis/Calc2/10-2-Taylor-series/Taylor-series-05.pg**
Find the first three **nonzero** terms of the Taylor series for the function $f(x) = \sqrt{6x - x^2}$ about the point $a = 3$. (Your answers should include the variable x when appropriate.)

$\sqrt{6x-x^2} =$ ________ + ________ + ________ + ...

3. **(1 pt) Library/FortLewis/Calc2/9-5-Power-series/power-series-01.pg**
Find all the values of x such that the given series would converge.

$$\sum_{n=1}^{\infty} \frac{7^n (x-3)^n (n+1)}{n+9}$$

Answer: ______

Note: Give your answer in **interval notation**.

4. **(1 pt) Library/FortLewis/Calc2/10-1-Taylor-polynomials/Taylor-polynomials-01.pg**
Find the degree 3 Taylor polynomial approximation to the function $f(x) = 3\ln(\sec(x))$ about the point $a = 0$.

$3\ln(\sec(x)) \approx$ ____________

5. **(1 pt) Library/Rochester/setDiffEQ9Linear2ndOrderHomog-/ur_de_9_18.pg**
Find y as a function of x if

$$x^2y'' + 6xy' - 14y = 0,$$

$y(1) = 0, \; y'(1) = 10.$
$y =$______

6. **(1 pt) Library/Rochester/setDiffEQ9Linear2ndOrderHomog-/ur_de_9_19.pg**
Find y as a function of x if

$$x^2y'' + 15xy' + 49y = 0,$$

$y(1) = -1, \; y'(1) = 3.$
$y =$______

7. **(1 pt) Library/Rochester/setSeries8Power/eva8_5a_1.pg**
Find the interval of convergence for the given power series.

$$\sum_{n=1}^{\infty} \frac{(x-7)^n}{n(-4)^n}$$

The series is convergent
from $x =$ ___, left end included (enter Y or N): ___
to $x =$ ___, right end included (enter Y or N): ___

8. **(1 pt) Library/Rochester/setSeries8Power/eva8_5a_2.pg**
Find all the values of x such that the given series would converge.

$$\sum_{n=1}^{\infty} \frac{(6x)^n}{n^{10}}$$

The series is convergent
from $x =$ ___, left end included (enter Y or N): ___
to $x =$ ___, right end included (enter Y or N): ___

9. **(1 pt) Library/Rochester/setSeries8Power/eva8_5a_3.pg**
Find all the values of x such that the given series would converge.

$$\sum_{n=1}^{\infty} \frac{(x-3)^n}{3^n}$$

The series is convergent
from $x =$ ___, left end included (enter Y or N): ___
to $x =$ ___, right end included (enter Y or N): ___

10. **(1 pt) Library/Rochester/setSeries8Power/eva8_5a_4.pg**
Find all the values of x such that the given series would converge.

$$\sum_{n=1}^{\infty} \frac{(-1)^n x^n}{9^n (n^2+8)}$$

The series is convergent
from $x =$ ___, left end included (enter Y or N): ___
to $x =$ ___, right end included (enter Y or N): ___

11. (1 pt) Library/Rochester/setSeries8Power/eva8_6b.pg

The function $f(x) = \frac{3}{(1-10x)^2}$ is represented as a power series $f(x) = \sum_{n=0}^{\infty} c_n x^n$.

Find the first few coefficients in the power series.

$c_0 =$ __________

$c_1 =$ __________

$c_2 =$ __________

$c_3 =$ __________

$c_4 =$ __________

Find the radius of convergence R of the series.

$R =$ __________ .

12. (1 pt) Library/Rochester/setSeries8Power/eva8_6g.pg

The function $f(x) = 4x\ln(1+x)$ is represented as a power series $f(x) = \sum_{n=0}^{\infty} c_n x^n$.

Find the FOLLOWING coefficients in the power series.

$c_2 =$ __________
$c_3 =$ __________
$c_4 =$ __________
$c_5 =$ __________
$c_6 =$ __________

Find the radius of convergence R of the series.
$R =$ __________ .

13. (1 pt) Library/Rochester/setSeries8Power/powerseries.pg

POWER SERIES AND TAYLOR POLYNOMIALS

Power Series

A power series $\sum_{n=0}^{\infty} a_n x^n$ has a RADIUS OF CONVERGENCE r.
The series converges for $|x| < r$ and diverges for $|x| > r$.
The radius of convergence is usually calculated by the ratio test, applied to the terms of the power series.
Suppose that $\lim_{n\to\infty} |\frac{a_{n+1}}{a_n}|$ exists. Then the power series converges if
$|x| \lim_{n\to\infty} |\frac{a_{n+1}}{a_n}| < 1$ and diverges if $|x| \lim_{n\to\infty} |\frac{a_{n+1}}{a_n}| > 1$. The radius of convergence is $r = \left(\lim_{n\to\infty} |\frac{a_{n+1}}{a_n}|\right)^{-1}$.
To determine whether the power series converges when $x = r$, replace x by r in the power series and decide whether the resulting numerical series, $\sum_{n=0}^{\infty} a_n r^n$ converges. The ratio test will not help in deciding this. Use some other convergence test.
To determine whether the power series converges when $x = -r$, proceed analogously.

Taylor and MacLaurin series

If $f(x) = \sum_{n=0}^{\infty} a_n x^n$ converges in some interval $(-s, s)$ containing the point zero, then for each n:
$a_n = \frac{1}{n!} f^{(n)}(0)$.
Power series may be integrated or differentiated term by term.
That is:
$$\frac{df}{dx} = \sum_{n=0}^{\infty} (n+1) a_{n+1} x^n.$$
$$\int_0^x f(t)dt = \sum_{n=1}^{\infty} \left(\frac{1}{n}\right) a_{n-1} x^n.$$
The nth degree MacLaurin polynomial for f(x) is
$$T_n(x) = \sum_{j=0}^{n} \frac{f^{(j)}(0)}{j!} x^j$$
It approximates f(x) with error $R_n(x)$.
That is, $f(x) = T_n(x) + R_n(x)$. The size of the error is estimated by
$|R_n(x)| < M \frac{|x|^{(n+1)}}{(n+1)!}$.
Here, M is an upper bound for the (n+1)-st derivative of f between 0 and x. It is enough that
$|f^{(n+1)}(t)| < M$ for all t such that $|t| < |x|$.
For every statement above you should know the analogous statement for a power series in powers of $(x-c)$ which has the form $\sum_{n=0}^{\infty} a_n (x-c)^n$.

To receive a point enter the letter y.
answer ___