1. **(1 pt) Library/UMN/calculusStewartCCC/s_11_10_13.pg**
Find the first five non-zero terms of Taylor series centered at $x = 3$ for the function below.

$$f(x) = e^x$$

Answer: $f(x) =$ ____ + ____ + ____ + ____ + ____ $+ \cdots$

What is the radius of convergence?
Answer: $R =$ ____

2. **(1 pt) Library/WHFreeman/Rogawski_Calculus_Early_Transcendentals_Second_Edition-/10_Infinite_Series/10.7_Taylor_Series/10.7.3.pg**

Find the Maclaurin series and corresponding interval of convergence of the following function.

$$f(x) = \frac{1}{1-4x}$$

$f(x) = \sum_{n=0}^{\infty}$ ____
The interval of convergence is: ____
Solution: *(Instructor solution preview: show the student solution after due date.)*

Solution:
Substituting $4x$ for x in the Maclaurin series for $\frac{1}{1-x}$ gives

$$\frac{1}{1-4x} = \sum_{n=0}^{\infty} (4x)^n$$

This series is valid for $|4x| < 1$, or $|x| < \frac{1}{4}$. Thus, the interval of convergence is $(-\frac{1}{4}, \frac{1}{4})$.

3. **(1 pt) Library/Utah/AP_Calculus_I/set14_Review/1250s14q31.pg**
Taylor and MacLaurin Series: Consider the approximation of the exponential by its third degree Taylor Polynomial:
$e^x \approx P_3(x) = 1 + x + \frac{x^2}{2} + \frac{x^3}{6}$.

Compute the error $e^x - P_3(x)$ for various values of x:
$e^0 - P_3(0) =$ ____.
$e^{0.1} - P_3(0.1) =$ ____.
$e^{0.5} - P_3(0.5) =$ ____.
$e^1 - P_3(1) =$ ____.
$e^2 - P_3(2) =$ ____.
$e^{-1} - P_3(-1) =$ ____.

4. **(1 pt) Library/Utah/Calculus_II/set9_Infinite_Series/set9_pr13.pg**
Suppose that $f(x)$ and $g(x)$ are given by the power series
$f(x) = 3 + 7x + 3x^2 + 2x^3 + \cdots$
and
$g(x) = 7 + 8x + 5x^2 + 4x^3 + \cdots$.

By multiplying power series, find the first few terms of the series for the product
$h(x) = f(x) \cdot g(x) = c_0 + c_1 x + c_2 x^2 + c_3 x^3 + \cdots$.

$c_0 =$ ____

$c_1 =$ ____

$c_2 =$ ____

$c_3 =$ ____

5. **(1 pt) Library/Michigan/Chap10Sec2/Q31.pg**
By recognizing each series below as a Taylor series evaluated at a particular value of x, find the sum of each convergent series.
A. $1 + 3 + \frac{3^2}{2!} + \frac{3^3}{3!} + \frac{3^4}{4!} + \cdots + \frac{3^n}{n!} + \cdots =$ ____
B. $1 + \frac{1}{3} + (\frac{1}{3})^2 + (\frac{1}{3})^3 + (\frac{1}{3})^4 + \cdots + (\frac{1}{3})^n + \cdots =$ ____
Solution: *(Instructor solution preview: show the student solution after due date.)*

SOLUTION
A. This is the series for e^x with x replaced by 3, so the series converges to e^3.
B. This is the series for $\frac{1}{1-x}$ with x replaced by $\frac{1}{3}$, so the series converges to $\frac{1}{1-\frac{1}{3}}$.

6. **(1 pt) Library/Indiana/Indiana_setSeries8Power/eva8_5a_2.pg**
Find all the values of x such that the given series would converge.

$$\sum_{n=1}^{\infty} \frac{(11x)^n}{n^4}$$

The series is convergent

from x = ___, left end included (Y,N): ___
to x = ___, right end included(Y,N): ___

Solution: *(Instructor solution preview: show the student solution after due date.)*

Solution:

We must find the interval of convergence. We use the ratio test, which is very trustworthy for this purpose:

$$\lim_{n\to\infty}\left|\frac{\left(\frac{(11x)^{n+1}}{(n+1)^4}\right)}{\left(\frac{(11x)^n}{n^4}\right)}\right| = \lim_{n\to\infty}\left|\frac{11x}{\left(\frac{n+1}{n}\right)^4}\right| = |11x|$$

Then we use the resulting expression to get the interval of convergence by checking when it is less than 1:

$$|11x| < 1 \iff |x| < \frac{1}{11} \iff \frac{-1}{11} < x < \frac{1}{11}$$

Thus we must simply check endpoints now.

When $x = \frac{-1}{11}$:

$$\sum_{n=1}^{\infty}\frac{(11x)^n}{n^4} = \sum_{n=1}^{\infty}\frac{(-1)^n}{n^4}$$

This is convergent by the alternating series test, since clearly $\frac{1}{n^4}$ approaches 0.

When $x = \frac{1}{11}$:

$$\sum_{n=1}^{\infty}\frac{(11x)^n}{n^4} = \sum_{n=1}^{\infty}\frac{1}{n^4}$$

This is convergent as a p-series by box 1, p.716.

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7. **(1 pt) Library/ma123DB/set13/s11_12_16.pg**
Find $T_5(x)$, the degree 5 Taylor polynomial of the function $f(x) = \cos(x)$ at $a = 0$.

$T_5(x) =$ ________________

Find all values of x for which this approximation is within 0.004906 of the right answer. Assume for simplicity that we limit ourselves to $|x| \leq 1$.

$|x| \leq$ _____

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8. **(1 pt) Library/Michigan/Chap10Sec4/Q15.pg**
What is the minimal degree Taylor polynomial about $x = 0$ that you need to calculate $\sin(1)$ to 3 decimal places?
degree = _____
To 6 decimal places?
degree = _____
Solution: *(Instructor solution preview: show the student solution after due date.)*

SOLUTION
By using the Error Bound for Taylor Polynomials, if we approximate $\sin(1)$ using the n^{th} degree polynomial, the error is at most $\frac{1}{(n+1)!}$. For the answer to be correct to four decimal places, the error must be less than 0.0005. Thus, the first n such that $\frac{1}{(n+1)!} < 0.0005$ will work. In particular, this is first true when $n = 6$.
For 6 decimal places, we need $\frac{1}{(n+1)!} < 5 \times 10^{-7}$, for which $n = 9$ works.