9.1

17) $\sum_{n=0}^{\infty} \sin^n\left(\frac{\pi}{4} + n\pi\right)$

$$\left(\frac{1}{\sqrt{2}}\right)^0 + \left(-\frac{1}{\sqrt{2}}\right)^1 + \left(\frac{1}{\sqrt{2}}\right)^2$$

$$\sum_{n=0}^{\infty} 1\left(-\frac{1}{\sqrt{2}}\right)^n \qquad \frac{1}{1 - -\frac{1}{\sqrt{2}}}$$

$$\left(\frac{1}{\sqrt{2}}\right)^0 + \left(-\frac{1}{\sqrt{2}}\right)^1 + \left(\frac{1}{\sqrt{2}}\right)^2 + \ldots + \left(-\frac{1}{\sqrt{2}}\right)^n + \ldots$$

21) $\sum_{n=0}^{\infty} 2^n x^n = \sum_{n=0}^{\infty} (2x)^n \qquad |2x| < 1 \qquad \left(-\frac{1}{2}, \frac{1}{2}\right)$

$|x| < \frac{1}{2}$

$$\sum_{n=0}^{\infty} 2^n x^n = \frac{1}{1-2x}$$

$|x-c| < R$

$c = 0 \qquad R = \frac{1}{2}$

27) $\sum_{n=0}^{\infty} 2^n n x^{n-1} = \frac{2}{(1-2x)^2}$

$(1-2x)^{-1}$

$-(1-2x)^{-2}[-2]$

31) $\sum_{n=0}^{\infty} \frac{2^n}{n+1} x^{n+1} = -\frac{1}{2}\ln|1-2x|$

$\int \frac{1}{1-2x}$

$-\frac{1}{2}\ln|1-2x|$

9.1

23) $\sum_{n=0}^{\infty} (-\frac{1}{2})^n (x-3)^n = \sum_{n=0}^{\infty} \left(-\frac{1}{2}\cdot(x-3)\right)^n$

$\frac{1}{1-(-\frac{1}{2}(x-3))}$ $\qquad \left|+\frac{1}{2}(x-3)\right| < 1$

$\frac{1}{1+\frac{1}{2}x-\frac{3}{2}}$ $\qquad |x-3| < 2$

$\boxed{(1,5)}$

$\frac{1}{\frac{1}{2}x-\frac{1}{2}} = \boxed{\frac{2}{x-1}}$

$\frac{1}{\frac{1}{2}(x-1)}$

$\frac{d}{dx}\; 2(x-1)^{-1}$

$-2(x-1)^{-2}$

29) $\sum_{n=0}^{\infty} \frac{(-\frac{1}{2})^n n}{} (x-3)^{n-1} = \frac{-2}{(x-1)^2}$

$x + x^2 + x^3 + x^4 + \dots + x^{n+1} + \dots$

$1 + 2x + 3x^2 + 4x^3 + \dots + (n+1)x^n + \dots$

$2 + 6x + 12x^2 + \dots + n(n+1)x^{n-1}$

---

33 $\sum_{n=0}^{\infty} \frac{(-\frac{1}{2})^n}{n+1} (x-3)^{n+1} = 2\ln|x-1| \qquad \int \frac{2}{x-1}\,dx$

9.1

53) $\sum_{n=1}^{\infty} ar^{n-1} \Rightarrow \frac{a(1-r^n)}{1-r} = S_n = \frac{a-ar^n}{1-r}$

$r<1 \quad \lim_{n\to\infty} \frac{a(1-r^n)}{1-r} = \frac{a}{1-r}$

$r>1 \quad \lim_{n\to\infty} \frac{a(1-r^n)}{1-r} = \infty$

71) $\sum_{n=0}^{\infty} (x-1)^n = \frac{1}{1-(x-1)} = \frac{1}{2-x}$

$\int \frac{1}{2-x}$

$-\ln|2-x| + c$

$-\ln c|2-x|$

$-\ln \frac{|2-x|}{c}$