Evaluar una suma En los ejercicios 13 a 20, utilice las propiedades de la notación sigma y el teorema 4.2 para calcular la suma. Utilice la función de suma de la herramienta de graficación para comprobar el resultado.

13. $\sum_{i=1}^{12} 7$
14. $\sum_{i=1}^{30} -18$
15. $\sum_{i=1}^{24} 4i$
16. $\sum_{i=1}^{16} (5i - 4)$
17. $\sum_{i=1}^{20} (i - 1)^2$
18. $\sum_{i=1}^{10} (i^2 - 1)$
19. $\sum_{i=1}^{15} i(i - 1)^2$
20. $\sum_{i=1}^{25} (i^3 - 2i)$

Larson, pp 263.

(13) $\sum_{i=1}^{12} 7$

$\sum_{i=1}^{n} k = kn$

$k = 7$, $n = 12$

$7(12)$

84

(14) $\sum_{i=1}^{30} -18$

$\sum_{i=1}^{n} k = kn$

$k = -18$, $n = 30$

$-18(30)$

-540

(15) $\sum_{i=1}^{24} 4i$

$\sum_{i=1}^{n} ka_i = k\sum_{i=1}^{n} a_i$

$4\sum_{i=1}^{24} i$

$\sum_{i=1}^{n} i = \frac{n(n+1)}{2}$

$4\frac{(24)(24+1)}{2}$

$4(12)(25)$

$4(300)$

1200

(16) $\sum_{i=1}^{16} 5i - 4$

$\sum_{i=1}^{n} a_i + b_i = \sum_{i=1}^{n} a_i + \sum_{i=1}^{n} b_i$

$\sum_{i=1}^{16} 5i - \sum_{i=1}^{16} 4$

$\sum_{i=1}^{n} k_i = k\sum_{i=1}^{n} i$

$\sum_{i=1}^{n} k = kn$

$5\sum_{i=1}^{16} i - 4(16)$

$\sum_{i=1}^{n} i = \frac{n(n+1)}{2}$

$5\left[\frac{16(16+1)}{2}\right] - 64$

$5[8(17)] - 64$

$40(17) - 64$

$680 - 64$

616

(17) $\sum_{i=1}^{20} (i-1)^2$

$(a+b)^2 = a^2 + 2ab + b^2$

$\sum_{i=1}^{20} i^2 - 2i + 1$

$\sum_{i=1}^{n} a_i + b_i = \sum_{i=1}^{n} a_i + \sum_{i=1}^{n} b_i$

$\sum_{i=1}^{20} i^2 - \sum_{i=1}^{20} 2i + \sum_{i=1}^{20} 1$

$\sum_{i=1}^{n} i^2 = \frac{n(n+1)(2n+1)}{6}$

$$\sum_{i=1}^{n} k a_i = k \sum_{i=1}^{n} a_i$$

$$\sum_{i=1}^{n} k = kn$$

$$\left[\frac{20(20+1)(2\cdot 20+1)}{6}\right] - 2\sum_{i=1}^{n} i + [20(1)]$$

$$\sum_{i=1}^{n} i = \frac{n(n+1)}{2}$$

$$\left[\frac{(10\cdot 2)(21)(41)}{3\cdot 2}\right] - \left[2\left(\frac{20(20+1)}{2}\right)\right] + (20)$$

$$[10(7)(41)] - [20(21)] + 20$$

$$2870 - 420 + 20$$

$$2890 - 420$$

$$2470$$

(18) $\sum_{i=1}^{10} i^2 - 1$

$$\sum_{i=1}^{n} a_i + b_i = \sum_{i=1}^{n} a_i + \sum_{i=1}^{n} b_i$$

$$\sum_{i=1}^{10} i^2 - \sum_{i=1}^{10} 1$$

$$\sum_{i=1}^{n} i^2 = \frac{n(n+1)(2n+1)}{6}$$

$$\sum_{i=1}^{n} k = kn$$

$$\left[\frac{10(10+1)(2\cdot 10+1)}{6}\right] - [10(1)]$$

$$\left[\frac{(5\cdot 2)(11)(21)}{3\cdot 2}\right] - 10$$

$$[5(11)(7)] - 10$$

$$5(77) - 10$$

$$385 - 10$$

$$375$$

(19) $\sum_{i=1}^{15} i(i-1)^2$

$$i(i-1)^2$$

$$(a+b)^2 = a^2 + 2ab + b^2$$

$$i(i^2 - 2i + 1)$$

$$i^3 - 2i^2 + i$$

$$\sum_{i=1}^{15} i^3 - 2i^2 + i$$

$$\sum_{i=1}^{n} a_i + b_i = \sum_{i=1}^{n} a_i + \sum_{i=1}^{n} b_i$$

$$\sum_{i=1}^{15} i^3 - \sum_{i=1}^{15} 2i^2 + \sum_{i=1}^{15} i$$

$$\sum_{i=1}^{n} i^3 = \frac{n^2(n+1)^2}{4}$$

$$\sum_{i=1}^{n} k a_i = k \sum_{i=1}^{n} a_i$$

$$\sum_{i=1}^{n} i = \frac{n(n+1)}{2}$$

$$\left[\frac{(15)^2(15+1)^2}{4}\right] - 2\sum_{i=1}^{15} i^2 + \left[\frac{15(15+1)}{2}\right]$$

$$\sum_{i=1}^{n} i^2 = \frac{n(n+1)(2n+1)}{6}$$

$$\left[\frac{(15)^2(16)^2}{2^2}\right] - 2\left[\frac{15(15+1)(2\cdot 15+1)}{6}\right] + \left[\frac{15(16)}{2}\right]$$

$$(ab)^n = a^n b^n$$

$$\left(\frac{a^n}{b^n}\right) = \frac{a^n}{b^n}$$

$$\left(\frac{15\cdot 16}{2}\right)^2 - 2\left[\frac{(3\cdot 5)(16)(31)}{3\cdot 2}\right] + [15(8)]$$

$$(15\cdot 8)^2 - [80(31)] + 120$$

$$(120)^2 - 2480 + 120$$

$$14400 - 2480 + 120$$

$$14520 - 2480$$

$$12040$$

(20) $\sum_{i=1}^{25} i^3 - 2i$

$$\sum_{i=1}^{n} a_i + b_i = \sum_{i=1}^{n} a_i + \sum_{i=1}^{n} b_i$$

$$\sum_{i=1}^{25} i^3 - \sum_{i=1}^{25} 2i$$

$$\sum_{i=1}^{n} i^3 = \frac{n^2(n+1)^2}{4}$$

$$\sum_{i=1}^{n} k a_i = k \sum_{i=1}^{n} a_i$$

$$\left[\frac{(25)^2(26)^2}{4}\right] - 2\sum_{i=1}^{25} i$$

$$\sum_{i=1}^{n} i = \frac{n(n+1)}{2}$$

$$\left[\frac{(25)^2(26)^2}{2^2}\right] - 2\left[\frac{25(26)}{2}\right]$$

$$(ab)^n = a^n b^n$$

$$\left(\frac{a}{b}\right)^n = \frac{a^n}{b^n}$$

$$\left[\left(\frac{25 \cdot 26}{2}\right)^2\right] - 650$$

$(25 \cdot 13)^2 - 650$

$(325)^2 - 650$

$105\,625 - 650$

$104\,975$

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