§ 2.6 #1 Prove by induction.

$$1+2+3+4+\dots+n = \frac{n(n+1)}{2}$$

Proof

- Base Case $n=1$

$$1 = \frac{1(1+1)}{2}$$

$$1 = 1 \checkmark$$

- Assume true for $n=k$, shows true for $n=k+1$

$n=k$ $\quad 1+2+3+4+\dots+k = \frac{k(k+1)}{2}$

$+(k+1) \qquad\qquad +(k+1)$

$$1+2+3+\dots+k+(k+1) = \frac{k(k+1)}{2} + \frac{(k+1)\cdot 2}{2}$$

$$= \frac{k(k+1)+2(k+1)}{2}$$

$$= \frac{(k+1)(k+2)}{2}$$

$n=k+1$ $\quad 1+2+3+\dots+k+(k+1) = \frac{(k+1)((k+1)+1)}{2}$

$\square$

§2.6 # 2

Prove by induction

$$2+4+6+\dots+2n = n(n+1)$$

<u>Proof</u>

- <u>Base</u> Case

$n=1$ $\qquad 2 = 1(1+1)$

$\qquad 2=2$ ✓

- Assume true for $n=k$, show true for $n=k+1$

$n=k$ $\quad 2+4+6+\dots+2k = k(k+1)$

$\qquad +2(k+1) \qquad +2(k+1)$

$$2+4+6+\dots+2k+2(k+1) = k(k+1)+2(k+1)$$

$$= k^2+k+2k+2$$

$$= k^2+3k+2$$

$$= (k+1)(k+2)$$

$n=k+1$ $\quad 2+4+6+\dots+2k+2(k+1) = (k+1)((k+1)+1)$

□

§2.6 #3

SOLUTION

Prove by induction

$$3+7+11+\dots+(4n-1)=n(2n+1)$$

Pf

• Base case $n=1$ $\quad 3 \overset{?}{=} 1(2\cdot1+1)$

$3=3$ ✓

• Assume true for $n=k$. Show true for $n=k+1$

$n=k$ $\quad 3+7+11+\dots+(4k-1)=k(2k+1)$

$+(4(k+1)-1) \qquad +(4(k+1)-1)$

$$3+7+11+\dots+(4k-1)+(4(k+1)-1)=k(2k+1)+(4(k+1)-1)$$

$$=2k^2+k+4k+4-1$$

$$=2k^2+5k+3$$

$$=(k+1)(2k+3)$$

$$=(k+1)(2k+2+1)$$

$n=k+1$ $\quad 3+7+11+\dots+(4k-1)+(4(k+1)-1)=(k+1)(2(k+1)+1)$

$\square$