**Math 231 – HW 10 Name: Troy Jeffery**

Epp 2nd Ed. 4.2 3, 6, 8

4.3 1, 2, 8, 22

**4.2 (3)** For each positive integer n, let P(n) be the formula: .

Exploration: Write out and check each of the following:

|  |  |
| --- | --- |
|  | |
| P(4): | √ |
| P(3): | √ |
| P(2): | √ |

Now, do the problem from the book:

|  |  |
| --- | --- |
| (a) Write out P(1). Is it true? | √ |
| (b) Write P(k). |  |
| (c) Write P(k+1). |  |
| (d) In a proof by mathematical induction that the formula holds for all integers n≥1, what must be shown in the inductive step? | We need to verify the formula by checking the first step (P(k)), then we assume that the formula is correct and show that it works for the next step (P(k+1)). |

**4.2 (6)** Without using Theorem 4.2.2, use mathematical induction to prove that:

for all integers n≥1.

Exploration: Write out and check each of the following:

|  |  |
| --- | --- |
|  | |
| P(4): |  |
| P(3): |  |
| P(2): |  |

Now, do the formal proof:

**4.2 (8)** Without using Theorem 4.2.3, use mathematical induction to prove that:

for all integers n≥0.

Exploration: Write out and check each of the following:

P(3):

P(2):

P(1):

Now, do the formal proof:

**4.3 (1)** Based on the discussion of the product at the beginning of this section, conjecture a formula for general n (n≥2). Prove your conjecture by mathematical induction.

Exploration: Write out the product for each of the following, and find a simplified fraction answer:

n=2:

n=3:

n=4:

What do you think the correct formula is?

=

Now, do a formal proof that your formula is correct:

**4.3 (2)** Experiment with computing values of the product , and conjecture a formula for general n (n≥1). Prove your conjecture by mathematical induction.

Exploration: Write out the product for each of the following, and find a simplified fraction answer:

n=1:

n=2:

n=3:

What do you think the correct formula is?

=

Now, do a formal proof that your formula is correct:

**4.3 (8)** Prove the statement by mathematical induction:

is divisible by 3, for all integers n≥1.

Exploration: Check the statement for each of the following:

n=2:

n=3:

n=4:

Now, do the formal proof:

**4.3 (22)** A sequence is defined by letting b0=5, and bk=4+bk-1, for all k≥1.

Show that bn=5+4n for all integers n≥0.

Exploration: Check the statement by showing how to calculate the value using both the recursive and explicit formulas:

|  |  |  |
| --- | --- | --- |
| *n or k value* | *answer using the recursive formula:* | *answer using the explicit formula:* |
| 0 |  |  |
| 1 |  |  |
| 2 |  |  |
| 3 |  |  |
| 4 |  |  |

Now, do the formal proof: