Midterm Review

Use mathematical induction to prove that for all positive integers $n \geq 2$

$$2(2)^1 + 3(2)^2 + 4(2)^3 + \cdots + n(2)^{n-1} = (n-1)2^n$$

Midterm Review

Use mathematical induction to prove that for all positive integers $n \geq 1$

$$n^3 + 2n \text{ is divisible by } 3$$

Midterm Review

Write the following in sigma notation (do not evaluate) :

$$1 - 3 + 5 - 7 + 9 - 11 + 13 - 15$$

$$1 - 9 + 25 - 49 + 81 - 121 + 169 - 225$$

Midterm Review

Evaluate

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

Midterm Review

Evaluate

$$\sum_{i=14}^{27} (2i+4)(3i-1)$$

Find the limit of each of the following convergent sequences:

$$\left\{ \frac{6 - 4n^2 + 5n^4}{4n^4 - n + 3} \right\}$$

$$\left\{ \frac{\sqrt{2n^2 + 5}}{3 - 2n} \right\}$$

$$\left\{ \frac{8n^2 + 100n + 5000}{1000 - 2n^2} \right\}$$

$$\left\{ \sqrt{n^2 + 3n} - n \right\}$$

Midterm Review

Prove that the terms of the recursively defined sequence

$$c_1 = 1 \qquad\qquad c_{n+1} = \frac{1}{4 - c_n}$$

satisy $0 \leq c_n \leq 1$

What other information is needed to conclude that the sequence has a limit? Find the limit of this sequence.

Midterm Review

Consider the sequence

$$c_1 = 2 \qquad\qquad c_{n+1} = 2 - \sqrt{3 - c_n}.$$

Assume that $0 \leq c_n \leq 2$ for $n \geq 1$.
Prove that $\{c_n\}$ converges and find its limit.

Midterm Review

Prove that the sequence

$$c_1 = 2 \qquad\qquad c_{n+1} = \frac{4 - c_n}{3}$$

has a limit and find it.

Midterm Review

Find an explicit expression for the general term of the recurrsively defined sequence:

$$c_1 = 2 \qquad\qquad c_{n+1} = \frac{1}{2}(c_n + 4)$$

Midterm Review

Find an explicit expression for the general term of the recurrsively defined sequence:

$$c_1 = 3 \qquad\qquad c_{n+1} = 2\left(3 - \frac{1}{2}c_n\right)$$

Midterm Review

Write the following expressions in Cartesian form:

$$(2+i)^2(\overline{1-3i})$$

$$\frac{1}{2-i}+\frac{2}{1+2i}$$

$$(3i)^5(4-2i)$$

$$\frac{\overline{(3+2i)}}{(3-i)}$$

Midterm Review

One root of the equation $x^3 - 7x^2 + 16x - 10$ is $3 - i$. Find the remaining roots.

Midterm Review

Find the value of k if $(x+2)$ is a factor of $x^4 - 2x^3 + 3x^2 + kx - 4$.

Midterm Review

$$P(x) = 6x^3 + 11x^2 - 4x - 4$$

- Apply Descartes rules of signs to $P(x)$. Be specific about what information it gives.
- Apply the bound theorem to $P(x)$.
- What are the possible rational roots of $P(x)$? Restrict the set with respect to any information from above.
- Find all zeros of $P(x)$.

Midterm Review

$$P(x) = 2x^3 + 3x^2 + 3x + 1$$

- Apply Descartes rules of signs to $P(x)$. Be specific about what information it gives.
- Apply the bound theorem to $P(x)$.
- What are the possible rational roots of $P(x)$? Restrict the set with respect to any information from above.
- Find all zeros of $P(x)$.