MTH 166, Quiz #18, Fall 2017 Name KEY

Instructions: Show all work. Use exact answers unless specifically asked to round. Answer all parts of each question.

1. Find the sum of $\sum_{i=0}^{4} \frac{(-1)^i}{i!}$.

$$\frac{(-1)^0}{0!} + \frac{(-1)^1}{1!} + \frac{(-1)^2}{2!} + \frac{(-1)^3}{3!} + \frac{(-1)^4}{4!} =$$

$$\cancel{\frac{1}{1}} - \cancel{\frac{1}{1}} + \frac{1}{2} - \frac{1}{6} + \frac{1}{24} = \boxed{\frac{3}{8}}$$

2. Use mathematical induction to prove that $\sum_{i=1}^{n}(4i - 1) = n(2n + 1)$.

if $i = 1 = n$ $\quad 4(1)-1 = 4-1 = 3 \qquad 1(2(1)+1)) = 1(3) = 3$ ✓

if it works for $n=k$, show for $n=k+1$

$$\sum_{i=1}^{k+1}(4i-1) = \sum_{i=1}^{k}(4i-1) + 4[(k+1)]-1 = k(2k+1) + 4k+3$$

$$= 2k^2 + 5k + 3 = (2k+3)(k+1) = (k+1)[2(k+1)+1]$$

which is what we expect, there it is true for all n.

3. Use the binomial theorem to expand $(x^2 - y)^4$.

$$\binom{4}{0}(x^2)^4(-y)^0 + \binom{4}{1}(x^2)^3(-y) + \binom{4}{2}(x^2)^2(-y)^2 + \binom{4}{3}(x^2)^1(-y)^3 + \binom{4}{4}(x^2)^0(-y)^4$$

$$= x^8 - 4x^6y + 6x^4y^2 - 4x^2y^3 + y^4$$