Name _____ Date _____

Unit 18: Parametric Equations & Proof by Induction Homework

1. Page 586 #3, 5, 8, 9, 17, 19

2. Page 587 #23, 24

3. $x = 4\sec\theta \qquad y = 3\tan\theta$

4. $x = \dfrac{1}{t} \qquad y = 2t + 3$

5. $x = 1 - t^2 \qquad y = 1 + t^2$

6. Page 587 #30: Graph on a calculator (set t-step to 0.05)

7. Page 733 #1, 4, 5, 8

8. Prove: $N^3 + 3N^2 + 2N$ is divisible by 3

9. Prove: $5^N - 1$ is divisible by 4

10. Prove: $2\left(1 + 3 + 3^2 + \ldots + 3^{N-1}\right) = 3^N - 1$

11. Prove: $3^N > 2N + 1$ for $N \geq 2$

12. Prove: $\dfrac{1}{1\,\text{g}2} + \dfrac{1}{2\,\text{g}3} + \ldots + \dfrac{1}{n(n+1)} = \dfrac{n}{n+1}$

13. Prove: $n! > 2^N$ for $n \geq 4$

14. Prove: $\sin(\theta + N\pi) = (-1)^N \sin\theta$

15. Page 733 #12

16. Prove: $11^N - 4^N$ is divisible by 7

17. $3^N > 10N$ for $N \geq 4$

18. Graph: $x = 3\sqrt{t-3}$ $y = 4\sqrt{4-t}$

19. Particles A and B move in the x-y plane according to the following equations:

$$A: \quad x = 3t - 2 \qquad\qquad B: \quad x = 2t - 1$$
$$y = -6t + 6 \qquad\qquad\qquad y = -(2t-3)^2 + 1$$

   Show algebraically that these particles "collide". Justify when the collisions occur.

20. For $0 \le t \le 20$ a particle moves in the x-y plane according to:

$$x = t - \ln t$$
$$y = \cos t - \ln t$$

   At what time is x at its minimum value?

21. Prove: $N(N^2 + 5)$ is divisible by 6

22. Graph: $x = 2^t - 2^{-t}$ $y = 2^t + 2^{-t}$