Answers to Parametrics Review Worksheet

2. $y = 1/x + 13$ 3. $y = \sqrt{14 - 3x}$ 4. $Y = 8(x - 4)^3$

5. $y - 2x$ 6. $\frac{x^2}{16} + \frac{y^2}{4} = 1$ *7. $Y = 2 - 2x^2$

*8. $y = 48/x^2$ 9. $\frac{(x-4)^2}{4} + \frac{(y+1)^2}{16} = 1$ 10. $\frac{(y-7)^2}{4} - \frac{(x+4)^2}{9} = 1$

* Don't graph the same as the parametric equations.

11. $x = t$ and $y = (t - 2)^3 - 4$
$x = t + 2$ and $y = t^3 - 4$

12. $x = \sqrt{t^2 - 3}$ and $y = t$
$x = \sqrt{t - 3}$ and $y = \sqrt{t}$

13. $x = t^4 + 4$
$y = 2t$

14. $x = 4(t^4 - 3)$
$y = 2t + 7$

15. $x = t^4 - 6$
$y = 2t - 5$

16. a) $-10 < t < 10$, Zoom Standard and Zoom Square
b) The new graph has the same shape as the original but has been shifted left 1 and down 3.
c) $x = t + 5$ and $y = 2 \cdot t^2$
d) $x = (t - 1)(\cos 60°) - (t^2 - 3)(\sin 60°)$ and $y = (t - 1)(\sin 60°) + (t^2 - 3)(\cos 60°)$

17. a) $x = 2 \cdot \cos t - 5$ and $y = 2 \cdot \sin t$
b) $0 < t < 2\pi$, $-4.6 < x < 8.6$ and $-4.1 < y < 4.1$
c) Change t values to $0 < t < \pi$.
d) Change t values to $\pi/2 < t < 3\pi/2$

18. a) $x = \cos(t) - 3$ and $y = 4 \cdot \sin(t) + 4$
b) $0 < t < 2\pi$, Zoom Standard and Zoom Square
c) Change t values to $-\pi/2 < t < \pi/2$
d) Change t values to $\pi < t < 2\pi$

19. a) $x = 3\tan(t) - 3$ and $y = 4\sec(t)$
b) Change to degrees to avoid showing asymptotes, $0° < t < 360°$,
Zoom Standard and Zoom Square
c) Change x to $x = |3\tan(t)| - 3$
d) Change t values to $90° < t < 270°$

20. a) They intersect when $t = 3/7$ (set the x values equal) and the common point is (300, -.9).
b) Now they intersect when $t = 1/3$ and then at $t = 3/5$.

21. a) They intersect when $t = -8$ at (11, 4).

b) They cross, but at $t = -.5$ the minimum distance between them is .707.
c) They intersect when $t = 6$ at (24, 8).

22. b) It appears to change direction when $t = 0.6$ and when $t = 2.05$
d) The vertices of this cubic are clearer. FURTHERMORE, if we graph the function $y = 4x^3 - 16x^2 + 15x$, you can actually find maximum and minimum points to get the better approximations for those t values in part a).

23. a) $x1 = 18t$ and $y1 = 1$. $x2 = 22t$ and $y2 = 1.1$ (This puts them in parallel lanes.)
b) $0 < t < 42$, $0 < x < 900$, $0 < y < 2$
c) $t = 900/22 = 40.41$ hours
d) $x1(40.41) = 736.36$ miles from Corpus Cristi.
e) $22t - 18t = 82 \Rightarrow t = 20.5$ hours into the trip.
f) $4t < 60 \Rightarrow t < 15$ hours into the trip.

24. Let $xJ = 12t$ and $xM = 4 - 8t$, set their x values equal to each other and get that at 6:12 they should meet. (The yJ and yM should be the same constant value.)

25. $xD = 4t$ and $yD = 1$. $xM = 20(t - .5)$ and $yM = 1.1$ (This keeps her in a parallel lane so she won't run over the drone.) But their x values should be equal, and solving gives us that, at $t = 5/8$ hour (meaning at 4:37.5), they find the drone.

26. a) $x = 58\cos(41°)t$ and $y = -16t^2 + 58\sin(41°)t + 5$
b) $0 < t < 4$, $0 < x < 100$, $0 < y < 50$
c) When $t = 58\sin(41°)/32$, $y_{max} = 27.62$ feet.
d) Use quadform to find when $y = 0$ and get $t = 2.503$ seconds. $x(2.503) = 109.57'$.

27. a) $x_m = (50\cos 45°)t$ and $y_m = (50\sin 45°)t - 16t^2$ and
$x_k = (45\cos 50°)t$ and $y_k = 80 - (45\sin 50°)t - 16t^2$
b) Graph $d = \sqrt{\left(\left(50\cos 45^\circ\right)t - \left(45\cos 50^\circ\right)t\right)^2 + \left(\left(50\sin 45^\circ\right)t - \left(80 - 45\sin 50^\circ\right)t\right)^2}$
At $t = 1.136$ seconds $d_{min} = 7.3356$ feet, so the balls will not collide.
c) Kate's ball will hit the ground first.
d) This is difficult to tell since we don't know the initial heights, but IF we assume the balls were sent from ground level, $x_m = 80 - 1.875 = 88.125'$ and $x_k = 62.32'$

28. SKETCH THESE FIRST! That way you see the 50° and 142° angles.
a) $xA = (600\cos 50°)t$ and $yA = (600\sin 50°)t$;
$xB = 1000 + (550\cos 142°)t$ and $yB = (550\sin 142°)t$

b) Graph the FUNCTION below and get that at t = 1.195 hours, the distance between them is 146.2 miles, so they shouldn't collide.

$$d=\sqrt{\left(1000+\left(550\cos 142^\circ\right)t-\left(600\cos 50^\circ\right)t\right)^2+\left(\left(550\sin 142^\circ\right)t-\left(600\sin 50^\circ\right)t\right)^2}$$

c) xA = (600cos 50°)t + (20cos 260°)t and yA = (600sin 50°)t + (20sin 260°)t;
xB = 1000 + (550cos 142°)t + (20cos 260°)t and yB = (550sin 142°)t + (20sin 260°)t

d) Since the wind acts on both of them, the d equation above is the same, so there will be no new flight plan.

29. $x = (v_0\cos\theta)\cdot t$ and $y = (v_0\sin\theta)\cdot t - 16t^2 + 5$, at t = 2, $50 = (v_0\cos\theta)\cdot 2$ or $(v_0\cos\theta) = 25$. Also $y = (v_0\sin\theta)\cdot 2 - 16\cdot 2^2 + 5 = 0 \Rightarrow (v_0\sin\theta) = 59/2$. Dividing, we get $\frac{(v_0\sin\theta)}{(v_0\cos\theta)} = \frac{59/2}{25} \Rightarrow \tan\theta = \frac{59}{50}$, so $\theta = 49.72°$ and $v_0 = 38.67$ ft/sec.

30. a) 110.5 feet
b) x = -101.5sin(3πt) and y = 110.5 – 101.5cos(3πt)
c) 0 < t < 4
d) Find y(2.5) = 110.5 feet.

31. a) $x = v_0(\cos\theta)t = (200)\left(\frac{3}{\sqrt{13}}\right)t$ and $y = v_0(\sin\theta)t - 16t^2 = (200)\left(\frac{2}{\sqrt{13}}\right)t - 16t^2$

b) Graph $d=\sqrt{\left((200)\left(\frac{3}{\sqrt{13}}\right)t-30\right)^2+\left((200)\left(\frac{2}{\sqrt{13}}\right)t-16t^2-20\right)^2}$ and we get that at t = 0.1816 seconds, d = 0.439 feet, which, for a small monkey might be a miss!

c) The monkey's equations will now be $x_m = 30$ and $y_m = 20 - 16t^2$. This makes the distance $d=\sqrt{\left((200)\left(\frac{3}{\sqrt{13}}\right)t-30\right)^2+\left((200)\left(\frac{2}{\sqrt{13}}\right)t-20\right)^2}$ and at t = 0.1803, d = 0, so the dart will hit the monkey.

33. if x = t – 1 ⇒ t = x + 1, so t values are {-4, -2, 0, 2, 4}