Math 143 Set 17

This exercise set reviews some of the concepts we have seen throughout the course.

23. Parameterize $\left\langle \dfrac{t}{\sqrt{1+t^2}}, \arctan t, \dfrac{1}{\sqrt{1+t^2}} \right\rangle$ by arclength.

24. Find the area enclosed by the polar equation $r(\theta) = \sin(2\theta)$.

25. Find the curvature and the unit tangent vector for the vector valued function $\mathbf{r}(t) = \langle a\cos t, b\sin t, 0\rangle$.

26. The degree 5 Taylor polynomial for $\cos x$ is $1 - x^2/2! + x^4/4!$. Find a bound on the error when using this to approximate $\cos 3$.

27. Do these series converge? Which test are you using?

a. $\displaystyle\sum_{n=1}^{\infty} \frac{(-1)^{n-1}}{2+\sqrt{n+1}}$

b. $\displaystyle\sum_{n=1}^{\infty} \frac{1-6^n}{1+2^n}$

c. $\displaystyle\sum_{n=1}^{\infty} \frac{n^2 + 2\sin n}{(n+1)^5}$

28. Find the first three terms in the series of $e^x \sin x$.

29. Find the radius of convergence for $\displaystyle\sum_{n=1}^{\infty} \frac{(-1)^n}{2^n + 1} x^n$.

30. Find the series representations for $\sqrt{x}\sin(\sqrt{3x})$ and $(e^{-x^2} - 1)/x$.

31. Find the line tangent to the curve $\langle t\cos t, t^2, t\sin t\rangle$ at $(-\pi, \pi^2, 0)$.