14. *a*. $\lim_{x\to 0}\frac{x^2}{\cos x}=0$ *This one's just a plug-and-chug.*

b. $\lim_{x\to 0}\frac{\sin^{-1}(3x)}{4x}=\lim_{x\to 0}\frac{\frac{1}{\sqrt{1-(3x)^2}}(3)}{4}=\frac{3}{4}$ *This one uses l'Hôpital's Rule.*

c. $\lim_{x\to 4}\frac{x^2-2x-8}{x^2-16}=\lim_{x\to 4}\frac{(x-4)(x+2)}{(x-4)(x+4)}=\lim_{x\to 4}\frac{x+2}{x+4}=\frac{6}{8}=\frac{3}{4}$ *The ol' "factor and cancel" trick!*

d. $\lim_{x\to -3}\left(\frac{5-\sqrt{x^2+16}}{x+3}\right)\left(\frac{5+\sqrt{x^2+16}}{5+\sqrt{x^2+16}}\right)=\lim_{x\to -3}\frac{25-\left(x^2+16\right)}{(x+3)\left(5+\sqrt{x^2+16}\right)}=\lim_{x\to -3}\frac{9-x^2}{(x+3)\left(5+\sqrt{x^2+16}\right)}$, and we can now factor the numerator: $\lim_{x\to -3}\frac{(3-x)(3+x)}{(x+3)\left(5+\sqrt{x^2+16}\right)}=\lim_{x\to -3}\frac{3-x}{5+\sqrt{x^2+16}}=\frac{6}{10}=\frac{3}{5}$.

14. (On page 2) $v(t)=6t^2+6t+1$

a. Average acceleration is $\bar{a}=\frac{v(2)-v(0)}{2-0}=\frac{37}{2}=18\frac{1}{2}\frac{\text{cm}}{\text{sec}}$.

b. Instantaneous acceleration requires the derivative: $a(t)=\frac{dv}{dt}=12t+6$, so *a*(2) = 30 cm per second.

c. Total displacement is an integral: $\int_0^2\left(6t^2+6t+1\right)dt=\left(2t^3+3t^2+t\right)\Big|_0^2=16+12+2=30$ cm.

15. $f(x)=2\sin x+2\cos x$, so $f'(x)=2\cos x-2\sin x$. Setting this to zero, we find critical numbers: $2\cos x-2\sin x=0\Rightarrow\cos x=\sin x$. The only place this happens between 0 and $\frac{\pi}{3}$ is at $\frac{\pi}{4}$, so that is our only critical number. Then, we test the two endpoints of the interval, and the critical number, back in the original. $f(0)=2\sin 0+2\cos 0=2$, while $f\left(\frac{\pi}{3}\right)=2\sin\left(\frac{\pi}{3}\right)+2\cos\left(\frac{\pi}{3}\right)=2\left(\frac{\sqrt{3}}{2}\right)+2\left(\frac{1}{2}\right)=\sqrt{3}+1$.

Finally, $f\left(\frac{\pi}{4}\right)=2\sin\left(\frac{\pi}{4}\right)+2\cos\left(\frac{\pi}{4}\right)=2\left(\frac{\sqrt{2}}{2}\right)+2\left(\frac{\sqrt{2}}{2}\right)$, which is $2\sqrt{2}$. Since we are given that $\sqrt{2}\approx 1.414$, $2\sqrt{2}\approx 2.828$, and since $\sqrt{3}\approx 1.732$, $\sqrt{3}+1\approx 2.732$, and we can compare these. So our absolute min is (0, 2), and the absolute max is $\left(\frac{\pi}{4}, 2\sqrt{2}\right)$.