Name: ______________________________

This page contains problems that use techniques you will need for Section 4.5 #231, 235 and 237

For each function, find all the critical points in the given domain.

1. $f(x) = e^x \cos(x)$ in $[0, 2\pi]$

$f'(x) = e^x \cos(x) - e^x \sin(x)$

$= e^x(\cos(x) - \sin(x))$

$f'(x) = 0$ when $\cos(x) - \sin(x) = 0$

or $\cos(x) = \sin(x)$

or $1 = \tan(x)$.

$\tan(x) = 1$ when $x = \frac{\pi}{4}$ or $\frac{5\pi}{4}$

ans: critical pts: $x = \frac{\pi}{4}$ and $x = \frac{5\pi}{4}$.

2. $f(x) = \sin(\pi x/2) - \cos(\pi x/2)$ on $[-2, 2]$

$f'(x) = \frac{\pi}{2}\cos(\frac{\pi x}{2}) + \frac{\pi}{2}\sin(\frac{\pi x}{2}) = \frac{\pi}{2}\left[\cos(\frac{\pi x}{2}) + \sin(\frac{\pi}{2}x)\right]$

$f'(x) = 0$ when $\frac{\pi}{2}\left(\cos(\frac{\pi x}{2}) + \sin(\frac{\pi}{2}x)\right) = 0$

or $\cos(\frac{\pi}{2}x) = -\sin(\frac{\pi}{2}x)$

or $-1 = \tan(\frac{\pi}{2}x)$

We know $\tan\theta = -1$ when $\theta = \frac{3\pi}{4}$ or $\theta = -\frac{\pi}{4}$

So we need

$\frac{\pi}{2}x = \frac{3\pi}{4}$ or $\frac{\pi}{2}x = \frac{-\pi}{4}$

So $x = \frac{6}{4} = \frac{3}{2}$ or $x = -\frac{1}{2}$

answer: crit. pts are $x = \frac{3}{2}$ or $x = -\frac{1}{2}$

3. $f(x) = \frac{5}{x+1}$ on $(-\infty, -1) \cup (-1, \infty)$

$f(x) = 5(x+1)^{-1}$

$f'(x) = -5(x+1)^{-2}(1)$

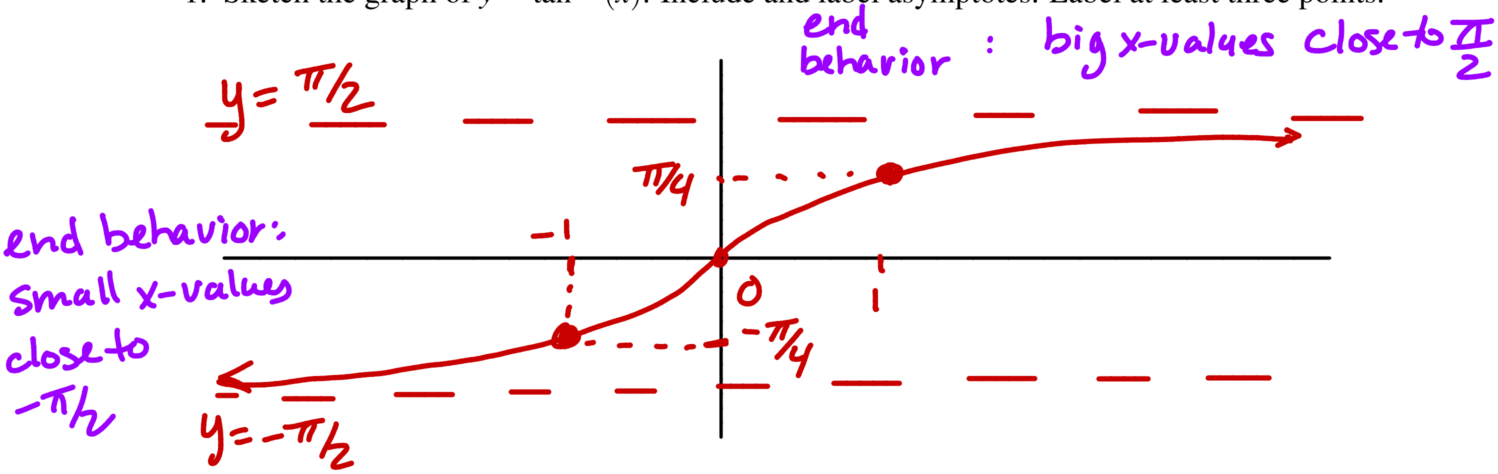
$= \frac{-5}{(x+1)^2}$

f' is never zero + never undefined in its domain.

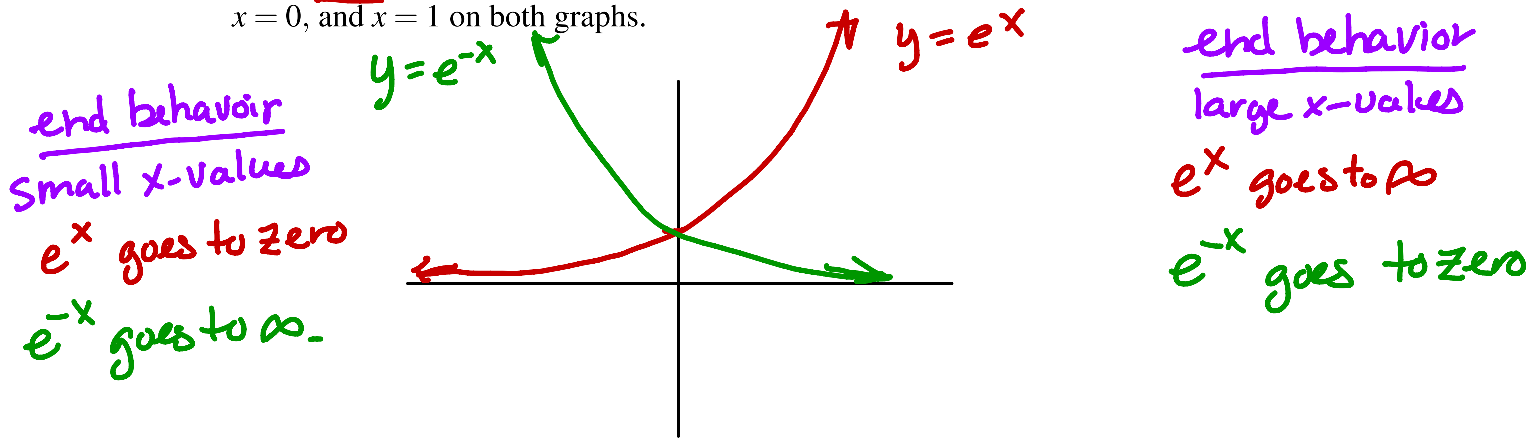
<u>No</u> critical points.

This page contains skills / facts needed in Section 4.6.

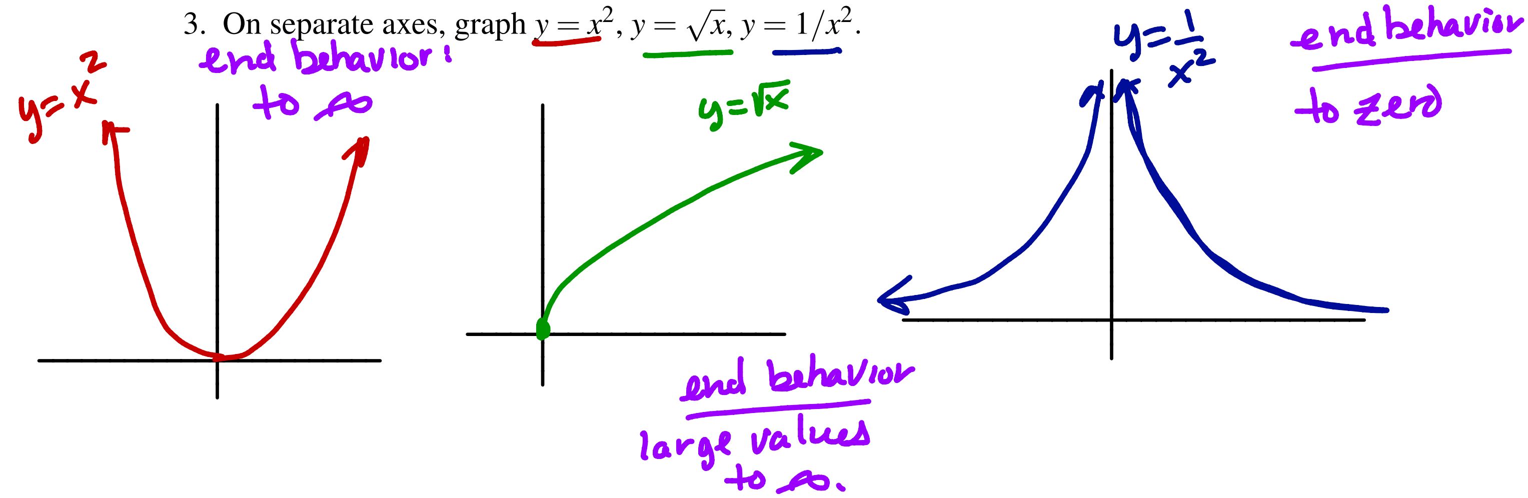
1. Sketch the graph of $y = \tan^{-1}(x)$. Include and label asymptotes. Label at least three points.



2. Graph $y = e^x$ and $y = e^{-x}$ on the same set of axes. Label the points associated with $x = -1$, $x = 0$, and $x = 1$ on both graphs.



3. On separate axes, graph $y = x^2$, $y = \sqrt{x}$, $y = 1/x^2$.



4. For all of the graphs above, describe the **end behavior** of the graphs. This means, describe what happens for really large x values (think 10^{100} and really small x-values (think -10^{100}. Note "small" means toward negative infinity, not close to zero.