ACE Calculus
Mr. Bo
Name
Mixed Final Review - Worksheet 6

1) $\lim _{x \rightarrow 3} \frac{27-x^{3}}{x-3}$
2) $\lim _{x \rightarrow 0} \frac{\sqrt{x+9}-3}{x}$
3) $\lim _{x \rightarrow 0} \frac{\sin 6 x}{4 x}$
4) $\lim _{x \rightarrow \infty} \frac{x+2 x^{2}}{4 x+3}$
5) $\lim _{x \rightarrow 6} \frac{\sqrt{3 x+7}}{x-4}$
6) $\lim _{x \rightarrow 1} \frac{\frac{1}{x+1}-\frac{1}{2}}{x-1}$
7) $\frac{d}{d t}\left[3\left(t^{3}+2 t\right)^{4}\right]$
8) $\frac{d}{d x}[\csc (2 x)]$
9) $\frac{d}{d x}\left[3 x^{2}-\frac{1}{\sqrt{x}}+5\right]$
10) $\frac{d}{d x}\left[\frac{3 x+x^{4}}{x^{2}}\right]$
11) $\frac{d}{d x}\left[3 x^{2} \tan (2 x)\right]$
12) $\frac{d}{d x}\left[\cos ^{2}\left(\pi x^{3}+4\right)\right]$
13) $\int\left(x \sqrt{4 x^{2}-1}\right) d x$
14) $\int x \sqrt{x-1} d x$
15) $\int_{1}^{3} \frac{x^{2}-5 x+6}{x-2} d x$
16) $\int\left(5 \sec ^{2}(2 x) \tan ^{2}(2 x)\right) d x$
17) $\int \csc ^{2}(2 x) d x$
18) $\int_{0}^{\frac{\pi}{4}} x^{2} \cos \left(x^{3}\right) d x$
19) Find $\frac{d y}{d x}$ by differentiating implicitly: $7 x^{2}+6 x y+9 y^{2}=0$.
20) Use the definition of continuity to determine if the function has any discontinuities.

$$
f(x)=\left\{\begin{array}{cc}
x^{2}, & x=3 \\
x^{2}-1, & x \neq 3
\end{array}\right\}
$$

21) Give a $\delta, \varepsilon$ proof for the following limit: $\lim _{x \rightarrow 2} 2 x-7=-3$
22) Use the definition of derivative to find the derivative of $f(x)=3 x^{2}-4 x$.
23) Use the limit process to evaluate: $\int_{2}^{5}(3 x+1) d x$.
24) A 13 ft ladder is leaning against a house when its base starts to slide away. When the base of the ladder is 12 ft from the house, the base is moving at the rate of $5 \mathrm{ft} / \mathrm{sec}$.
a) How fast is the top of the ladder sliding down the wall then?
b) How fast is the angle between the ladder and the ground changing?
25) A rectangular pen will be built for a dog next to a garage with the garage being used as one of the sides. If the pen will be built using 144 linear feet of fencing, what dimensions would produce the pen with the greatest area? What is the maximum area?
26) Find the volume of the solid when the region bounded by $y=\sqrt{2 x}, \mathrm{y}=4$ and $\mathrm{x}=0$ is revolved around the line $y=6$ using the:
a) Washer method
b) Shell method
27) Find the surface area of revolution when $y=9-x^{2}$ is revolved around the $y$-axis on the interval $[0,3]$. Set up, but do not integrate.
