Name:
Solve the following equations for $x$ or state that none exist.

1. $5 e^{x}-2=0$
2. $5 e^{x}+4=0$
3. $5 \ln (x)-6=0$
4. $5 \ln (x)+7=0$

This page contains information and techniques you will need for Sections 4.5 and 4.6.

1. Write in your own words how to find the critical numbers of a function $f(x)$ and why they are important.
2. Draw a graph of a function $f(x)$ with domain $(-\infty, \infty)$ such that (i) $f^{\prime}(a)=f^{\prime}(b)=0$ and $f^{\prime}(c)$ is undefined, and
(i) $f$ has a local minimum at $x=a$, a local maximum at $x=c$ and neither at $x=b$.
3. Draw a graph of a function $f(x)$ with domain $(-\infty, \infty)$ such that
(a) $f(x)<0$ and $f^{\prime}(x)>0$.
(b) $f^{\prime}(x)<0$ and $f^{\prime \prime}(x)>0$.
4. For each function below, find (a) its domain and (b) all its critical points.
(a) $f(x)=x^{3}-2 x^{2}$
(b) $f(x)=x^{1 / 5}$
(c) $f(x)=\arctan (x)$
(d) $f(x)=\frac{x^{2}}{x^{2}-4}\left(\right.$ Note: $f^{\prime}(x)=\frac{-8 x}{\left(x^{2}-4\right)^{2}}$.)
(e) $f(x)=e^{(1-x)^{2}}$
(f) $f(x)=\sqrt{x^{2}-4}$
5. For each derivative below, determine the intervals for which that derivative is positive and negative.
(a) $f^{\prime}(x)=x^{-4 / 5}$
(b) $y^{\prime \prime}=\frac{8\left(3 x^{2}+4\right)}{\left(x^{2}-4\right)^{3}}$
(c) $g^{\prime}(x)=3 x^{2} e^{2 x}+2 x^{3} e^{2 x}$
6. Write a formula for a function $f(x)$ such that $f(x)$ has asymptotes $x=1, x=4$ and $y=0$.
7. Give an example of a graph with two different horizontal asymptotes.
8. Evaluate each limit below.
(a) $\lim _{x \rightarrow 2^{+}} \frac{5}{x-2}$
(d) $\lim _{x \rightarrow \infty} \frac{5}{x-2}$
(b) $\lim _{x \rightarrow 2^{-}} \frac{5}{x-2}$
(e) $\lim _{x \rightarrow-\infty} \frac{5}{x-2}$
(f) $\lim _{x \rightarrow \infty}\left(8+\frac{5}{x-2}\right)$
(c) $\lim _{x \rightarrow 2} \frac{5}{x-2}$
(g) $\lim _{x \rightarrow \infty}\left(x+\frac{5}{x-2}\right)$
