TEST #1
MA1160, Spring '02

NAME: _____

Please **show work** or give reasoning for **every** answer. I need some evidence that you understand the topics. (No credit will be given for correct answers without an indication of how you arrived at your conclusion.)

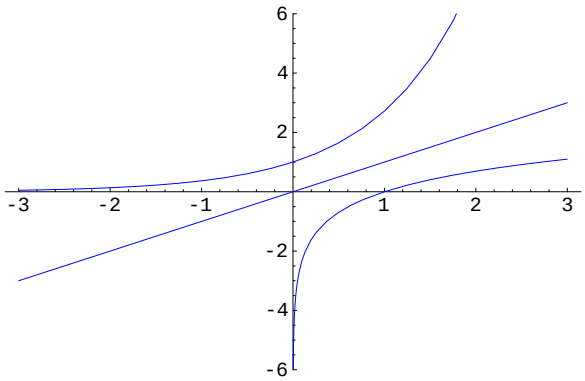
If you obtain an answer or part of an answer with your **calculator**, please indicate what you punched into your calculator and what the output was.

If you use a memorized or programmed **formula**, please write down the formula that you are using.

---

1. The following output is produced when you attempt to plot $y = e^x$, $y = \ln x$, and $y = x$ on the interval $[-3, 3]$ using *Mathematica*.

```
In[10]:=  theplot = Plot[{E^x, Log[x], x}, {x, -3, 3}, PlotRange -> {-6, 6}];
          Plot::plnr: Log[x] is not a machine-size real number at x = -3.
```



(Some error messages have been deleted to save space.)

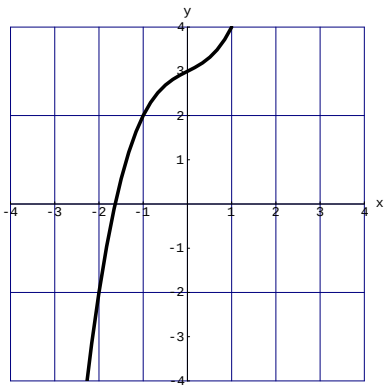
(a) Label each graph.

(b) Why is there an error message?

(c) Two of these graphs should look like mirror images of each other. Which? Why?

(d) Why do they NOT look like mirror images on this graph?

2. Shown at right is the graph of a function $y = F(x)$.



Use this graph to

(a) estimate $F(-2)$

(b) estimate $F^{-1}(2)$

(c) identify 3 points which will be on the graph of $y = F^{-1}(x)$.
(Give answers in the form "(x, y)".)

(d) estimate where $F(x)$ is concave up (identify any/all x-values)

---

3. (a) Sketch the graphs of both $y = \cos(x)$ and $y = \arccos(x)$, including scales (tick marks) for both axes.

(b) What is the domain of the function $f(x) = \arccos(x)$?

(c) What is the range of the function $f(x) = \arccos(x)$?

4. Complete the table of values, given that

- $\mathcal{E}(x)$ is an exponential function and
- the graph of $l(x)$ is a line.

x	$\mathcal{E}(x)$	$l(x)$
2	100	100
4	120	120
6		
8		

---

5. For each of the following functions, identify all intercepts and asymptotes (if any). If there are none, write "none" in the corresponding box.

Function	y intercept(s)	x intercept(s)	horizontal asymptote(s)	vertical asymptote(s)
$\mathcal{E}(x) = 5e^{-x}$				
$f(x) = \ln(x+2)$				
$r(x) = \dfrac{3x^2 - 12}{x^2 - 1}$				
$p(x) = (x-a)(x^2+a)$ (a is a **positive** constant)				

6. Suppose the voltage, V, in an electric outlet is given by

$$V = 339\sin(100\pi t),$$

where V is measure in volts and time, t, is measured in seconds.

(a) What is the amplitude of this oscillation?

(b) What is the period?

(c) Sketch a graph of V vs. t, labeling the amplitude and at least two x-intercepts.

---

7. Consider the following two calculations:

<u>Calculation A</u>

$$\begin{aligned} e^{5x} &= 2e^{2x} \\ \ln(e^{5x}) &= \ln(2e^{2x}) \\ 5x &= 2(2x) \\ 5x - 4x &= 0 \\ x &= 0. \end{aligned}$$

<u>Calculation B</u>

$$\begin{aligned} \ln(20x) &= 3\ln(x) \\ e^{\ln(20x)} &= e^{3\ln(x)} \\ 20x &= 3x \\ 17x &= 0 \\ x &= 0. \end{aligned}$$

(Questions on next page)

(a) Show how to check the answer to Calculation A without repeating the computation.
(Is the answer correct?)

(b) Identify which step of Calculation A is incorrect and why.

(c) Show how to solve the equation $e^{5x} = 2e^{2x}$ correctly by hand.

(d) Show how to check the answer to Calculation B without repeating the computation.

(e) (Extra credit)
Show how to solve the equation $\ln(20x) = 3\ln(x)$ correctly by hand.