

**INSTRUCTIONS:** Organize work neatly using pencil, notebook and graph paper. All work must be shown and graphs must be numbered and labeled appropriately.  
**DO NOT USE A CALCULATOR!**

1. a) Let  $f(x) = \sqrt{x}$ ; write the difference quotient  $\frac{f(x+h) - f(x)}{h}$ , then rationalize its numerator and simplify the result.  
b) Let  $g(x) = \frac{1}{x}$ ; write and simplify the difference quotient  $\frac{g(x+h) - g(x)}{h}$ .
2. Make a reasonable **hand-drawn** sketch of  $y = f(x) = \sin(x)$ . State the domain and range of the function. What is its absolute max? absolute min? What is its y- intercept? What are its x-intercepts?
3. Make a reasonable **hand-drawn** sketch of  $y = f(x) = \ln(x)$ . State the domain and range of the function. What is its absolute max? absolute min? What is its intercept? What is its asymptote?
4. Start with a reasonable **hand-drawn** sketch of  $y = f(x) = |x|$ . Use shifting techniques to help you sketch  $y = -f(x - 3) + 2$ .
5. Find an equation of the line which is perpendicular to  $3y - 4x = 1$  at  $(2, 3)$ .
6. Given  $f(x) = \sqrt{x}$  and  $g(x) = \frac{1}{x}$ , find  $f[g(x)]$  and  $g[f(x)]$ . Find the domain of each composite function.
7. Suppose that in  $\triangle ABC$  angle C is a right angle. If  $\cos \theta = \frac{12}{13}$ , find the exact values of the six trigonometric functions of angle  $\theta$ .
8. Solve each of the following for all exact real solutions. Simplify answers where possible.
  - a)  $3x^2 + 4x = 2$
  - b)  $\log_8 x = -\frac{2}{3}$
  - c)  $9^{4x+1} = 27$
  - d)  $\ln(x) + \ln(x-2) = 1$
  - e)  $\sin(x) = \cos(x)$  on  $[0, 2\pi)$
  - f)  $2 \cos^2(x) - \cos(x) - 1 = 0$  on  $(-4, 4)$

9. Complete the following table with **exact** values:

<b>x in degrees</b>	<b>x in radians</b>	<b>sin(x)</b>	<b>cot(x)</b>	<b>sec(x)</b>
$0^\circ$				
$30^\circ$				
	$\frac{B}{4}$			
	$\frac{B}{3}$			
$90^\circ$				
$135^\circ$				
	$-\frac{2B}{3}$			
$675^\circ$				