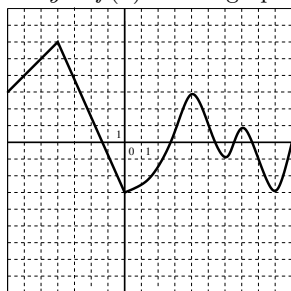


The Final Exam will be given on May 24, 2010 at 6:30pm in 2S-215.

1. Write down the equations of lines with the given description.

- (a) A line which passes through the points  $(1, 2)$  and  $(-2, 3)$ .  
 (b) A line with slope 3 and passing through the point  $(2, 2)$ .  
 (c) A line which passes through the origin and parallel to the line  $3x + 5y = 3$ .

2. Let  $y = f(x)$  be the graph given below.



- (a) What is the domain of  $f$  ?  
 (b) How many relative minima does  $f$  have ? Write the  $x$  and  $y$  values of the relative minima.

3. Use your calculator to find the only positive root of this equation:

$$x^3 + x^2 - 4x - 2 = 0$$

4. Solve the following equations using the quadratic formula:

(a)

$$\frac{3}{2}x^2 + \frac{1}{2}x - 1 = 0$$

(b)

$$\sqrt{x + 25} - 2x + 16 = 0$$

5. Let  $f(x) = \sqrt{x + 2} - 5$ .

- (a) Explain how you get this graph from the graph of  $g(x) = \sqrt{x}$ .  
 (b) Find the domain of  $f(x)$ .

6. Solve the following inequality and write the solution in interval notation (this means round parenthesis and/or square brackets). Also, sketch your answer on the real line.

$$\left| \frac{3}{2}x - 1 \right| < 4$$

7. Complete the square to find the vertex of the following parabola. Find the  $x$ -intercepts as well. Sketch the graph.

$$f(x) = x^2 - 6x + 8$$

8. Simplify the following expression

$$\frac{(8x^3)^{-2/3}y^3}{32(x\sqrt{y})^3}$$

9. Given the graph of  $f(x) = 3^{-x}$ , describe how to get the graph of  $g(x) = 3^{-(x-2)} - 1$ . Sketch both graphs on the same set of axes.

10. Evaluate

$$\log_2 \frac{1}{64}, \quad \ln e^{-0.2}, \quad \log_3 20$$

11. Use the properties of the logarithm to write the following expression as a sum, difference, and/or constant multiple of logarithm.

$$\log_2 \frac{8x^4(y-5)^2}{z^3}, \quad \log \sqrt[5]{\frac{z^4 y^5}{100 a^3}}$$

12. Solve the following equations

$$\log(x+21) + \log x = 2, \quad e^{2x-3} = 5$$

13. Alan has \$1000 today deposited in a bank where the interest rate is 5% per year compounded continuously. How much will he have 3 years from now? How much if the interest is compounded monthly? How long must he wait to have \$2000 in his account if the interest is compounded continuously?
14. Given  $\sin(\alpha) = -3/5$  with  $\frac{3\pi}{2} < \alpha < 2\pi$ , find the exact values of  $\cos(\alpha)$  and  $\tan(\alpha)$ . Draw a picture that explains your work.
15. (a) Determine the reference angle for  $\theta = 225^\circ$ , and plot  $\theta$  on the unit circle.  
(b) Find the exact values of  $\sin(225^\circ)$ , of  $\cos(225^\circ)$ , and of  $\tan(225^\circ)$ .  
(c) Convert  $225^\circ$  to radians.
16. At a distance of 135 ft on the ground, a light source shines onto a cloud. The angle between the ground and the light spot is measured to be  $67.35^\circ$ . How high is the cloud in the air?
17. Sketch one period of the graph  $y = 2 \sin(2x) - 1$ . Label the highest and the lowest point of your graph. Find the amplitude and the period.
18. Simplify

$$(1 - \sin \theta)(1 + \sin \theta) - \cos^2 \theta = ?$$