

## Topics and Practice Problems for the Calculus (MCALC) Placement Test

**General Information:** The exam consists of 25 multiple choice questions. Problems generally fall into one of 4 categories – simplify, solve, identify or model. The problems below are representative of those on the exam, but the list is not necessarily complete. The wording of the actual problems may vary slightly.

### **Simplify**

- $27^{1/3}16^{-1/2} =$
- $\frac{r^3 - s^3}{r^2 - s^2} =$
- Find  $f(x + h)$  if  $f(x) = \frac{2x + 1}{3 - x}$
- $\sin(x + h) =$
- $\cos x \tan x \csc^2 x =$

### **Solve**

- $\log_3(2x - 1) = 2$
- $\frac{(x + 1)(2 - 1)}{x + 2} = 3$
- $-x^2 + 2x + 3 < 0$
- $|-2x - 4| \leq 6$
- $\sin 3x = \frac{1}{2}$  for  $x \in [0, 2\pi]$

### **Identify**

- Identify whether a given graph is even, odd or neither.
- Identify the graph of  $y = x^2 + 4x - 1$  from a set of 4 choices.
- Identify the graph of  $y = \left(\frac{1}{2}\right)^x$  from a set of 4 choices.
- Identify the graph of  $y = \sec x$  from a set of 4 choices.
- Given the graph of a sinusoidal function, identify the formula from a set of 4 choices.

### **Model**

- A colony of bacteria doubles in number every 4 hours. By what factor has the population grown after 12 hours?
- A lighthouse sits on the shore. There is a pier 3 miles due west of the lighthouse. A ship is due south of the lighthouse, and is 7 miles from the pier. How far from the lighthouse is the ship?
- If  $3^6 \approx 700$ , then  $3^{12}$  is approximately equal to ... (pick one of 4 choices)
- Given the graph of a linear function,  $y = mx + b$ , identify whether  $m$  is positive or negative and whether  $b$  is positive or negative.
- Find an expression for the surface area of a rectangular box with top and bottom, for which the bottom is a square of side length  $x$ , and the height is  $h$ .
- Find an expression for the volume of a right circular cone for which the height is  $1/2$  of the diameter of the base.
- A rectangle has area  $100 \text{ m}^2$ . Its length is 4 m bigger than its width. Find the width.