

## Placement Guide for Math 130: Calculus for Biological Sciences, Social Sciences and Business I

**What is Math 130?** Math 130 is the first course in the Calculus sequence for students majoring in the biological sciences, social sciences, or business.

Note: *Some* biological sciences and some economics and business majors should take Math 150 instead of Math 130 depending on their transfer goals; see an academic counselor if you are unsure.

**Who should take Math 130?** You should take Math 130 if your academic goals require it and you assess yourself as *prepared to succeed* in this course after reading through this Guide.

**Am I ready for Math 130? What are my options?** On the next page you will find some problems to help you assess your readiness for Math 130. Depending on your comfort level with these problems you have three options:

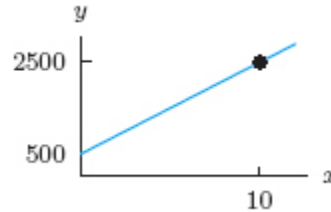
- **Enroll in Math 130:** Choose this option if you can confidently solve most of the problems.
- **Enroll in Math 130 along with Math 130C, a 2-unit Support Course:** Choose this option if most of these topics are familiar to you but *some* of the problems are unfamiliar or would be difficult to complete, or if you could generally use review on a lot of these topics.
- **Enroll in Math 137 or below:** Choose this option if a lot of the problems are unfamiliar to you or you feel uncomfortable with most of these skills. In this case, see the Placement Guide for Math 137 to help make your choice.

**Problems to help you assess your readiness for Math 130**

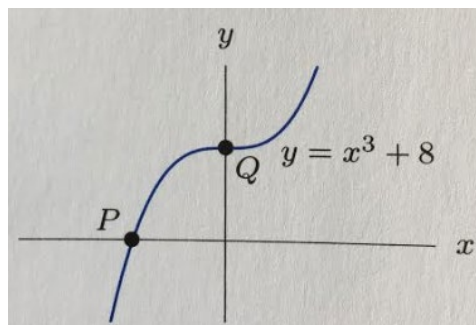
*Note:* You do not necessarily need to try to work through all these problems to completion. It may be enough to read through the problems and their solutions to get a feel for whether you are ready for Math 130.

*A calculator may be used throughout.*

1. Find an equation of the line in the figure to the right.



2. What are the coordinates of the points  $P$  and  $Q$  in the figure below?



3. Which of the following expressions is equivalent to  $\frac{T}{E} + E$ ?

- (a)  $\frac{E}{E^2 + T}$     (b)  $\frac{E^2 + T}{E}$     (c)  $E + T$     (d)  $\frac{T + E}{E + 1}$     (e)  $\frac{T + E}{E}$

4. Which of the following expressions is equivalent to  $x^{-1}y + y^{-1}x$ ?

- (a)  $\frac{xy}{x^2 + y^2}$     (b)  $\frac{x^2 + y^2}{xy}$     (c)  $\frac{xy}{x + y}$     (d)  $\frac{x + y}{xy}$     (e)  $\frac{y + x}{x + y}$

5. Simplify  $(x^2x^5)^4$ .

6. If  $\frac{\sqrt[3]{t}}{t} = t^a$ , what is  $a$ ?

7. Solve  $2x + a = 5(1 - x)$  for  $x$ .

8. Factor  $a^3b - ab^3$ .

9. If  $f(x) = x^2 - 2x + 1$ , find  $f(a - 1)$ .

10. Solve  $x^2 - 2x - 8 = 4(x - 2)$ .

11. The function  $y = f(x)$  is graphed below. Use the graph to answer the following:

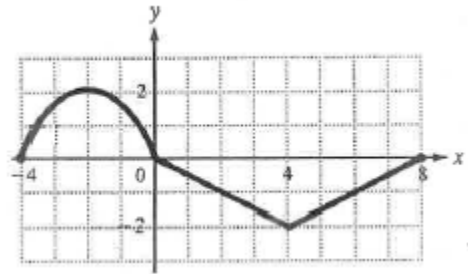
(a) Give the domain and range using interval notation.

(b) On what interval(s) of  $x$ -values is  $f$  increasing?

(c) On what interval(s) of  $x$ -values is  $f(x) \leq 0$ ?

(d) Find the value of  $f(-2)$  and  $f(6)$ .

(e) For which value(s) of  $x$  is  $f(x) = -2$ ?



12. Suppose that  $M = kN$  for some constant  $k$ . If  $M = 0.84$  when  $N = 12$ , what is  $M$  when  $N = 6$ ?

13. In a California town, the monthly charge for waste collection is \$8 for 32 gallons of waste and \$12.32 for 68 gallons of waste.

(a) Find a linear formula for the cost,  $C$ , of waste collection as a function of the number of gallons of waste,  $w$ .

(b) Use your formula from (a) to predict the cost for collecting 90 gallons of waste.

(c) What is the slope of the line found in (a)? Give units and interpret your answer in terms of the cost of waste collection.

14. An item that originally cost \$210 is now being sold for \$218.82. By what percent has the price increased?

## Solutions

1. The equation of a line may be written in the form  $y = mx + b$  where  $m$  is the slope and  $(0, b)$  is the  $y$ -intercept.

This line passes through the points  $(0, 500)$  and  $(10, 2500)$  so  $b = 500$  and the slope is

$$m = \frac{2500 - 500}{10 - 0} = 200.$$

Therefore the equation of the line is  $y = 200x + 500$

2. The point  $P$  has  $y$ -coordinate 0 and so the  $x$ -coordinate can be found by solving  $0 = x^3 + 8$ . This can be solved by inspection, or by subtracting 8 from both sides and taking the cube root of both sides, giving  $x = -2$ .

Therefore  $P = (-2, 0)$

The point  $Q$  has  $x$ -coordinate 0 and so  $y = 0^3 + 8 = 8$ . Therefore  $Q = (0, 8)$

3. The answer is (b) only:  $\frac{E^2 + T}{E} = \frac{E^2}{E} + \frac{T}{E} = E + \frac{T}{E}$ .

4. The answer is (b) only:  $\frac{x^2 + y^2}{xy} = \frac{x^2}{xy} + \frac{y^2}{xy} = \frac{x}{y} + \frac{y}{x} = xy^{-1} + yx^{-1} = x^{-1}y + y^{-1}x$

5.  $(x^2 x^5)^4 = (x^7)^4 = x^{28}$

6.  $\frac{\sqrt[3]{t}}{t} = \frac{t^{1/3}}{t^1} = t^{1/3-1} = t^{-2/3}$ . Therefore  $a = -\frac{2}{3}$

7.  $2x + a = 5(1 - x) \rightarrow 2x + a = 5 - 5x$ ; Add  $5x$  to both sides and subtract  $a$  from both sides to get  $7x = 5 - a$ .

Divide both sides by 7 to get  $x = \frac{5 - a}{7}$

8.  $a^3 b - ab^3 = ab(a^2 - b^2) = ab(a + b)(a - b)$

9.  $f(a - 1) = (a - 1)^2 - 2(a - 1) + 1 = a^2 - 2a + 1 - 2a + 2 + 1 = a^2 - 3a + 4$

10.  $x^2 - 2x - 8 = 4(x - 2)$

$$x^2 - 2x - 8 = 4x - 8$$

$$x^2 - 6x = 0$$

$$x(x - 6) = 0$$

$$x = 0, x = 6$$

11. (a) The domain is  $[-4, 8]$  and the range is  $[-2, 2]$ .  
 (b) The graph is increasing on the interval  $(-4, 2)$  and  $(4, 8)$ .  
 (c)  $[0, 8]$   
 (d)  $f(-2) = 2$  and  $f(6) = -1$   
 (e)  $x = 4$

12. First find  $k$  by substituting the given values of  $M$ , and  $N$ :  $0.84 = k \cdot 12 \rightarrow k = \frac{0.84}{12} = 0.07$ .

So when  $N = 6$ ,  $M = 0.07(6) = \boxed{0.42}$

13. (a) If  $C$  is a linear function of  $w$  then we are trying to find an equation of the form  $C = mw + b$ . We are given the ordered pairs  $(w, C) = (32, 8)$  and  $(68, 12.32)$ .

The slope is  $m = \frac{12.32 - 8}{68 - 32} = 0.12$ , so  $C = 0.12w + b$ .

To find  $b$ , substitute  $w = 32$  and  $C = 8$ :  $8 = 0.12(32) + b \rightarrow 8 = 3.84 + b \rightarrow b = 4.16$

This gives  $\boxed{C = 0.12w + 4.16}$

(b)  $C = 0.12(90) + 4.16 = 14.96 \rightarrow \boxed{\$14.96}$

(c) The slope is 0.12 dollars per gallon; the cost of waste collection increases at the rate of \$0.12 per gallon.

14.  $218.82 / 210 = 1.042$  which indicates that the price has increased by 4.2%.

**After reading through the solutions**, which of the following most closely describes you?

**A.** I am quite comfortable with all or almost all of these skills.

**B.** I am comfortable with a lot of these skills but some of the problems would be difficult for me to complete. I could use review on a lot of these topics.

**C.** I am uncomfortable or unfamiliar with a lot of these skills.

If you chose **A** then you should **Enroll in Math 130**.

If you chose **B** then you should **Enroll in Math 130 along with Math 130C, a 2-unit Support Course**.

You do *not* have to take the same instructor for Math 130C as you do for Math 130. Math 130C serves students from among *all* sections of Math 130.

If you chose **C** then you should **Enroll in Math 137 or below**. See the Placement Guide for Math 137:

<http://sbcc.edu/assessmentcenter//files/137placementguide.pdf>