MA 160 | Quiz #1 - Spring, 2012 |
Riseberg | (25 points) | Name Solutions

This take-home quiz is due on Thursday, February 2. Papers handed in after that date will <u>not</u> be accepted.

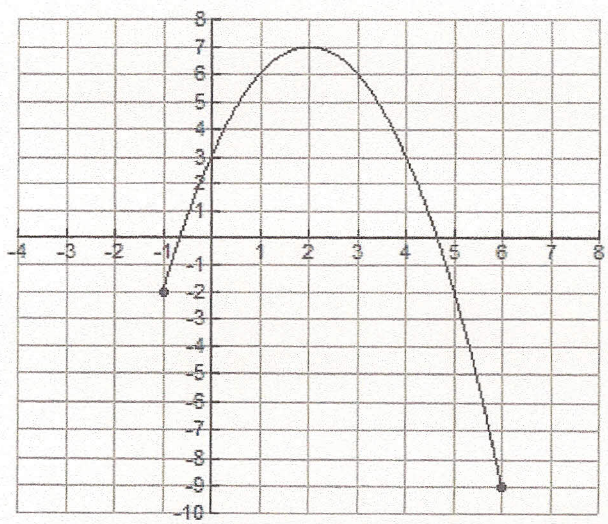
In order to get full credit, you must hand in your paper on time, and you must show all of your work neatly and clearly. You may use your book or notes and may work with other classmates when doing the problems; however, each student must turn in his or her own paper. You should not attempt to get help at the Math/Science Center.

If for any reason you are absent on Thursday, February 2, you should send me your quiz by e-mail or Fax, showing as much work as possible, and then hand in a written copy when you return to class.

Please list the names of any classmates with whom you worked:

Show all of your work on the quiz paper. Full credit is not given unless the answer follows from the work shown.

1. (4 points) The graph of a function f is shown.



(a) State the value of $f(1)$.

$f(1) = 6$

(b) For what values of x is $f(x) = 3$?

$x = 0, \ x = 4$

(c) State the domain of f. Use interval notation.

$[-1, 6]$

(d) State the range of f. Use interval notation.

$[-9, 7]$

2. (1 point) Some hot coffee is poured into a cup at room temperature. Let $F(t)$ be the function that represents the temperature (in degrees Fahrenheit) of the coffee at t minutes since the coffee was poured. Interpret the equation $F(7) = 156$ in this context. Answer in a complete sentence and use appropriate units.

Seven minutes after the coffee was poured, its temperature is 156° F.

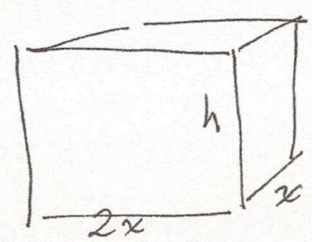
3. (3 points) A function f is given by $f(x) = x^2 - 7x - 4$. Find and simplify $\dfrac{f(a+h) - f(a)}{h}$.

$$\frac{(a+h)^2 - 7(a+h) - 4 - (a^2 - 7a - 4)}{h}$$

$$\frac{\cancel{a^2} + 2ah + h^2 - \cancel{7a} - 7h - \cancel{4} - \cancel{a^2} + \cancel{7a} + \cancel{4}}{h}$$

$$\frac{2ah + h^2 - 7h}{h} = \frac{h(2a + h - 7)}{h} = 2a + h - 7$$

4. (4 points) A closed rectangular box with volume 15 cubic feet has length equal to twice the width. Express the surface area as a function of the width. Simplify your answer.



$S = 2(2x^2) + 2(2xh) + 2(xh)$

$S = 4x^2 + 4xh + 2xh$

$S = 4x^2 + 6xh$

Since the volume is 15 ft^3,

$2x^2h = 15$ so $h = \dfrac{15}{2x^2}$ and

$$S = 4x^2 + 6x\left(\frac{15}{2x^2}\right) = 4x^2 + \frac{45}{x}$$

5. (3 points) A line goes through the pair of points (-2, 5) and (1, -7).

(a) Find the slope of the line.

$$m = \frac{-7-5}{1-(-2)} = \frac{-12}{3} = -4$$

(b) Find the equation of the line. Write your answer in the form $y = mx + b$.

$$y - 5 = -4(x+2)$$
$$y - 5 = -4x - 8$$
$$y = -4x - 3$$

6. (6 points) The population of Australia has been steadily increasing in the past 50 years. According to the data, the increase is approximately linear. In 1960, the population of Australia was approximately 10.3 million, and in 2008, it was approximately 21.4 million. Let $P(t)$ represent the population of Australia, in millions of people, as a function of t, where t represents years since 1960.

(a) Find the rate of change in the population of Australia. Write your answer as a decimal number and round it to two decimal places.

Use the points (0, 10.3) and (48, 21.4)

$$\frac{21.4 - 10.3}{48 - 0} = .23125 \approx .23$$

(b) Explain what the rate of change means in this context. **Write your answer in a sentence and use appropriate units.**

The population of Australia increased at a rate of .23 million people per year from 1960 to 2008.

(c) Find a linear function for $P(t)$.

$$P(t) = .23t + 10.3$$

(d) According to the function you found in part (c), what was the population of Australia in 2011?

$2011 - 1960 = 51$ so $t = 51$

$P(51) = .23(51) + 10.3 = 22.03$

The population of Australia was 22.03 million in 2011.

7. (1 point) Rewrite $f(x) = \frac{-7}{x^8}$ in the form $f(x) = Cx^a$.

$f(x) = -7x^{-8}$

8. (1 point) Rewrite the radical expression in exponential notation.

$\sqrt[3]{x^2} = x^{2/3}$

9. (2 points) If the cost, in dollars, of producing x items is given by
$C(x) = 16000 + 500x + 4x^{3/2}$

(a) Write the equation for a function that gives the average cost per item.

Average cost $= \frac{C(x)}{x} = \frac{16000 + 500x + 4x^{3/2}}{x}$

(b) Compute the average cost if 400 items are produced.

$\frac{C(400)}{400} = \frac{16000 + 500(400) + 4(400)^{3/2}}{400}$

$= \frac{248000}{400} = \$620$