

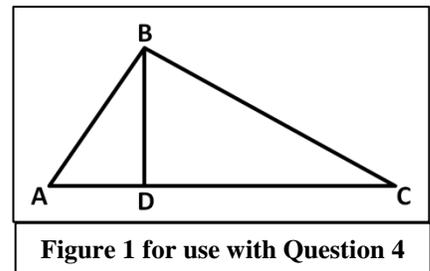
GENERAL INSTRUCTIONS: Read all instructions carefully.

1. You have 55 minutes to complete the Fundamental Concepts Exam (FCE).
2. This exam evaluates your understanding of fundamental pre-calculus skills. This is a non-technology exam. There are no references allowed during this exam.
3. Including this cover page and the answer sheet, there are seven pages to the exam.
4. Write your name on every exam page.
5. This exam is a multiple choice exam. Ensure you clearly and fully indicate your answer on the answer sheet (page 7 of the exam). If more than one answer is selected, the problem will be marked incorrect. If you change your answer, be sure to erase your original answer completely or make it very clear as to which answer you believe is the correct one.
6. Should you require additional space, use a blank sheet of paper. You are required to staple any continuation sheets to your exam prior to leaving.
7. There are a total of 25 questions with each question worth 4 points.
8. Early departure is authorized. Make sure you comply with exam turn-in requirements as outlined by your instructor.

<b>Question</b>	<b>Score</b>	<b>Question</b>	<b>Score</b>	<b>Question</b>	<b>Score</b>
<b>1</b>		<b>10</b>		<b>18</b>	
<b>2</b>		<b>11</b>		<b>19</b>	
<b>3</b>		<b>12</b>		<b>20</b>	
<b>4</b>		<b>13</b>		<b>21</b>	
<b>5</b>		<b>14</b>		<b>22</b>	
<b>6</b>		<b>15</b>		<b>23</b>	
<b>7</b>		<b>16</b>		<b>24</b>	
<b>8</b>		<b>17</b>		<b>25</b>	
<b>9</b>					

<b>Total Score</b>	
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1. An angle measuring  $\frac{5\pi}{4}$  radians is equivalent to how many degrees?
  - a.  $105^\circ$
  - b.  $90^\circ$
  - c.  $225^\circ$
  - d.  $135^\circ$
  
2. What are the roots of the function  $g(z) = z^2 - 3z - 18$ ?
  - a.  $\frac{3 \pm \sqrt{3^2 - 2}}{-72}$
  - b.  $-3$  and  $6$
  - c.  $-6$  and  $3$
  - d.  $-9$  and  $2$
  
3. What values of  $k$  satisfy  $2k^2 - k - 7 \geq -1 + k^2$ ?
  - a.  $k \leq -2$  and  $k \geq 3$
  - b.  $k \geq \frac{2}{3}$  and  $k \leq -1$
  - c.  $k \leq -3$  and  $k \geq 2$
  - d.  $k \leq -1$  and  $k \geq 6$
  
4. Using Figure 1, determine the length of  $\overline{BD}$  given that  $\overline{AC}$  is 24 inches long and the area of the triangle ABC is  $36 \text{ in}^2$ .
  - a. 1.5 in
  - b. 12 in
  - c. 4 in
  - d. 3 in
  
5. Given  $y = \log_6 x$ , find  $x$  when  $y = 3$ .
  - a.  $x = 2$
  - b.  $x = 729$
  - c.  $x = 36$
  - d.  $x = 216$



6. On a 100 mile road trip, you drive the first 50 miles at 30 mph. How long does the entire trip take if you are traveling 60 mph the rest of the way?
- a. 150 minutes
  - b. 110 minutes
  - c. 120 minutes
  - d. 135 minutes

7. Determine the equation of the line perpendicular to the line  $y = 4x + 5$  that goes through the point  $(-1, 3)$ .
- a.  $y = 4x + 7$
  - b.  $y = -\frac{1}{4}x + \frac{15}{4}$
  - c.  $y = -\frac{1}{4}x + \frac{11}{4}$
  - d.  $y = -\frac{1}{4}x + \frac{1}{4}$

8. Determine which function is displayed in Figure 2.
- a.  $y = 2x + 8$
  - b.  $y = 2x - 4$
  - c.  $y = 2x - 8$
  - d.  $y = 2x + 4$

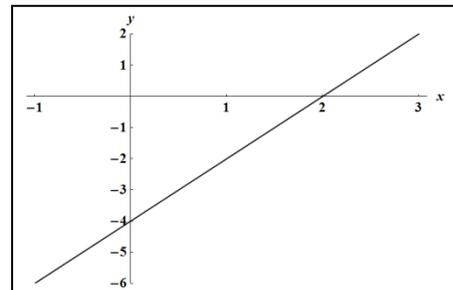


Figure 2 for use with Question 8

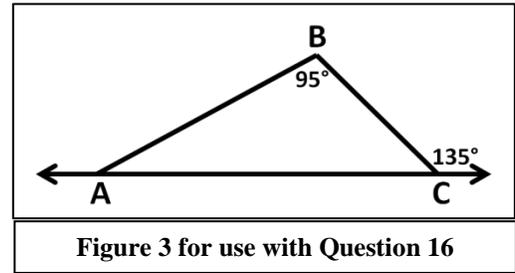
9. What is the range of  $f(\theta) = 2 \cos(2\theta)$ ?
- a. All Real Numbers
  - b.  $1 \leq f(\theta) \leq 3$
  - c.  $-3 \leq \theta \leq -1$
  - d.  $-2 \leq f(\theta) \leq 2$

10. Given that  $g(s) = s^2 + 3$  and  $h(t) = t - 1$ , find  $g(x + 2) - h(x - 1)$ .
- a.  $x^2 + 3x + 9$
  - b.  $x^2 + x + 2$
  - c.  $x^2 + 3x + 10$
  - d.  $x^2 + x + 6$

11. Simplify the following expression:  $\frac{12x^{10}y^8z^2}{32x^6y^{15}z^4}$ .
- $\frac{3x^4}{8y^7z^2}$
  - $\frac{x^4}{3y^7z^4}$
  - $x^6y^7z^2$
  - $\frac{3}{8x^6y^7z^2}$
12. What is the distance between the points (-3,-1) and (2,4)?
- 7
  - $\sqrt{34}$
  - $\sqrt{50}$
  - 8
13. Two cadets depart Thayer Gate at the same time. The first runs north at  $2\frac{1}{3}$  mph and the second runs south at 3 mph. What is the straight line distance between them after three hours?
- $5\frac{1}{3}$  miles
  - $10\frac{2}{3}$  miles
  - $\sqrt{\frac{130}{9}}$
  - 16 miles
14. Find where do the following lines intersect:  $y = 2x - 2$   
 $y = -4x + 10$
- They do not intersect.
  - (1,6)
  - (2,2)
  - (-2,0)
15. What is the domain of the real valued function  $f(z) = \frac{4}{\sqrt{z-10}}$ ?
- All Real Numbers
  - $z > 10$
  - $z < 10$
  - $z > \frac{4}{10}$

16. Using Figure 3, what is the angle  $BAC$ ?

- a.  $40^\circ$
- b.  $85^\circ$
- c.  $45^\circ$
- d.  $140^\circ$



17. What is the height of a right circular cylinder whose volume is  $80\pi \text{ in}^3$  and has a radius of 4 in?

- a. 4 in
- b. 3 in
- c. 6 in
- d. 5 in

18. Solve the following system of quadratic equations for  $x$ :

$$\begin{aligned} y &= x^2 - 4 \\ y &= -x^2 + 4 \end{aligned}$$

- a.  $x = 2$
- b.  $x = \pm 2$
- c.  $x = \pm 4$
- d.  $x = -2$

19. Express  $-0.003542$  in scientific notation.

- a.  $-3.542 \times 10^3$
- b.  $-35.42 \times 10^{-2}$
- c.  $-3.542 \times 10^{-3}$
- d.  $-35.42 \times 10^2$

20. Find all values of  $t$  that satisfy  $(3t - 3)(t + 2) = t^2 - t$ .

- a.  $-3$  and  $1$
- b.  $-\frac{1}{2}$  and  $2$
- c.  $0$  and  $1$
- d.  $-2$  and  $1$

21. Solve  $\left| \frac{y-2}{3} \right| < 6$  for  $y$ .

- a.  $y < -16$  and  $y > 20$
- b.  $-16 < y < 20$
- c.  $y < 20$
- d.  $-1 < y < 5$

22. Where does the graph of the function  $f(x) = 2x^2 + 3x - 5$  cross the  $x$ -axis?

- $x = -\frac{5}{2}$  and  $x = 1$
- $x = \frac{2 \pm \sqrt{4+40}}{6}$
- $x = \frac{-3 \pm \sqrt{9-40}}{4}$
- $x = \frac{5}{2}$  and  $x = -1$

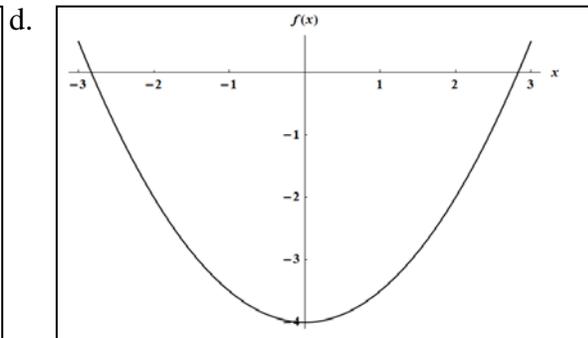
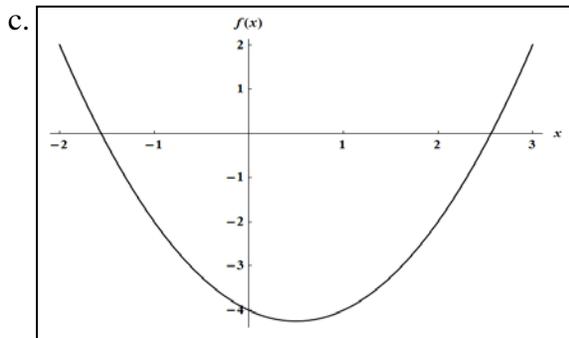
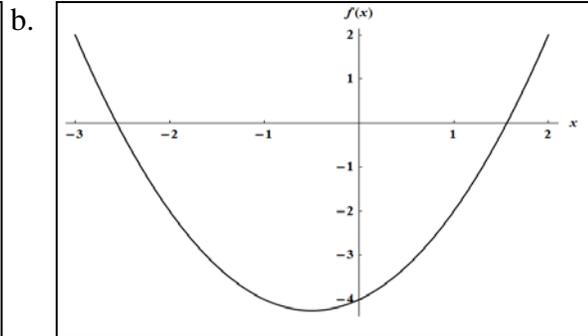
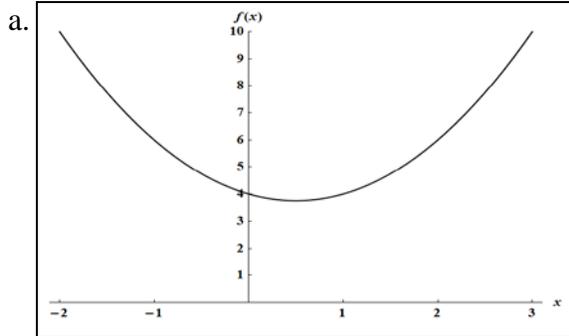
23. Evaluate  $\ln 1 + \log_2 64$

- 6
- $e + 4$
- 4
- $e + 6$

24. What is the equation of a line that goes through the points  $(5, 2)$  and  $(6, -4)$ ?

- $y = \frac{1}{6}x + \frac{7}{6}$
- $y = 6x - 40$
- $y = -\frac{1}{6}x + \frac{17}{6}$
- $y = -6x + 32$

25. Which of the following graphs represents  $f(x) = x^2 + x - 4$ ?



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FCE Version 2B – MA103

100 points

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1. (A) (B) (C) (D)

2. (A) (B) (C) (D)

3. (A) (B) (C) (D)

4. (A) (B) (C) (D)

5. (A) (B) (C) (D)

6. (A) (B) (C) (D)

7. (A) (B) (C) (D)

8. (A) (B) (C) (D)

9. (A) (B) (C) (D)

10. (A) (B) (C) (D)

11. (A) (B) (C) (D)

12. (A) (B) (C) (D)

13. (A) (B) (C) (D)

14. (A) (B) (C) (D)

15. (A) (B) (C) (D)

16. (A) (B) (C) (D)

17. (A) (B) (C) (D)

18. (A) (B) (C) (D)

19. (A) (B) (C) (D)

20. (A) (B) (C) (D)

21. (A) (B) (C) (D)

22. (A) (B) (C) (D)

23. (A) (B) (C) (D)

24. (A) (B) (C) (D)

25. (A) (B) (C) (D)