Classroom Voting Questions: Calculus I

4.3 Families of Curves

1. The functions in Figure 4.4 have the form $y = A\sin x$. Which of the functions has the largest A? Assume the scale on the vertical axes is the same for each graph.

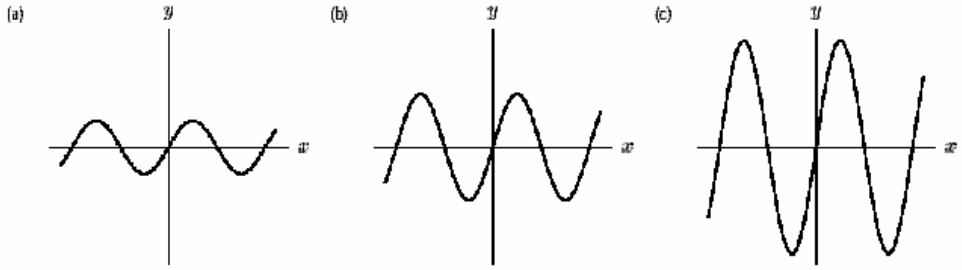

Figure 4.4

Answer: (c).

SVC.04.02.010

CC HZ MA131 F05: 0/0/**100**
CC HZ MA122 S06: 20/0/**80**
CC KC MA131 F05: 0/0/**100**
CC HZ MA131 F06: 0/0/**100**
CC KC MA121 F06: 4/0/**96**
CC HZ MA131 F07: 0/0/**100** time 0:40
CC JS MA131 F07: 0/0/**100** time 1:00
CC KC MA121 F07: 4/0/**96** time 1:40
CC LV MA121A S09: 40/5/**54** time 1:50
CC LV MA121B S09: 50/5/**45** time 1:30
CC HZ MA131 F09: 0/0/**92**/4 time 1:05
CC HZ MA131 F10: 0/0/**100** time 1:10
AS DH MA2513 010 S12: 56/22/**6**/17 time 1:40
CC HZ MA131 F11: 0/0/**91**
CC KC MA131 F14: 0/0/**100** time :40
CC KC MA131 S15: 0/0/**100**
CC KC MA131 F15: 0/0/**100** time 0:30
CC KC MA131 S16: 12/0/**88** time 0:30
CC KC MA131 F16: 0/0/**100**
CC KC MA131 S17: 0/0/**100**

2. The functions in Figure 4.5 have the form $y = \sin(Bx)$. Which of the functions has the largest B? Assume the scale on the horizontal axes is the same for each graph.

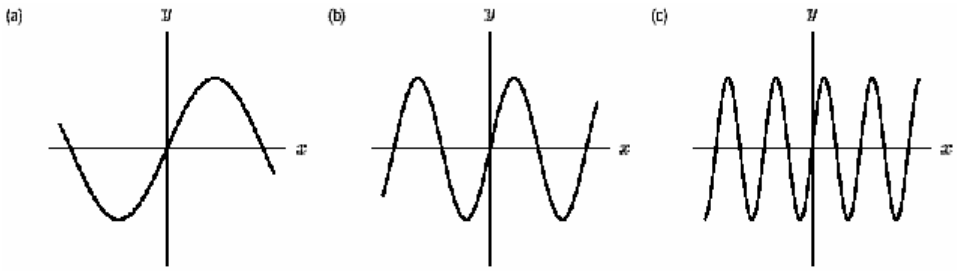

Figure 4.5

Answer: (c).

SVC.04.02.020

CC HZ MA131 F05: 70/0/**30**
CC HZ MA 122 S06: 90/0/**10**
CC KC MA131 F05: 36/0/**65**
CC HZ MA131 F06: 40/0/**60**
CC KC MA121 F06: 33/0/**67**
CC HZ MA131 F07: 53/0/**47** time 0:40
CC JS MA131 F07: 31/0/**69** time 0:35
CC KC MA121 F07: 17/0/**83** time 2:50
CC HZ MA131 F09: 72/0/**28** time 0:30
CC HZ MA131 F10: 48/0/**52** time 1:15
CC TM MA122 S12: 42//**58**
CC KC MA121A F11: 45/10/**45** "Individual, pre-discussion vote"
CC KC MA121A F11: 9/0/**91** Post small-group discussion vote
CC KC MA121D F11: 14/0/**86**
CC HZ MA131 F11: 32/0/**68** time 1:30
CC HZ MA131 F12: 43/0/**57** time 1:00
CC KC MA131 F14: 50/0/**50** time :30
CC KC MA131 S15: 33/0/**67** time 1:00
CC KC MA131 F15: 12/0/**88** time 1:00
CC KC MA131 S16: 52/0/**48** time 1:00
CC KC MA131 F16: 6/0/**94**
CC KC MA131 S17: 6/0/**94**

3. Let $f(x) = ax + b/x$. What are the critical points of $f(x)$?

   (a) $-b/a$

   (b) 0

   (c) $\pm\sqrt{b/a}$

   (d) $\pm\sqrt{-b/a}$

   (e) No critial points

Answer: (c,e). (c) if a and b are either both positive or both negative; (e) if a and b have opposite signs

SVC.04.02.030

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CC HZ MA 122 S06: 0/0/**60**/0/**40**
CC KC MA131 F05: 0/17/**39**/36/**17**
CC HZ MA131 F06: 5/15/**60**/10/**10**
CC KC MA121 F06: 0/0/**59**/0/**41**
CC HZ MA131 F07: 7/0/**67**/20/**7** time 3:10
CC JS MA131 F07: 0/12/**69**/6/**12** time 2:50
CC KC MA121 F07: 0/0/**92**/4/**4** time 5:00
CC HZ MA131 F09: 8/4/**68**/20/0 time 3:20
CC HZ MA131 F10: 0/0/**75**/15/10 time 3:00
CC TM MA122 S12: 37/5/**53**/5
CC KC MA121A F11: 0/24/**52**/5/19 "Individual, pre-discussion vote"
CC KC MA121A F11: 5/5/**80**/10/0 Post small-group discussion vote
CC KC MA121D F11: 7/7/**71**/14 time 3:45
CC HZ MA131 F11: 0/0/**85**/15/0 time 4:00
CC HZ MA131 F12: 5/0/**50**/35/10 time 3:30
CC KC MA131 F14: 5/14/**81**/0/0 time 3:45
CC KC MA131 F15: 0/0/**100**/0/0 time 4:00
CC KC MA131 S16: 4/9/**61**/22/4 time 3:10
CC KC MA131 F16: 0/24/**70**/0/6
CC KC MA131 S17: 0/0/**89**/11/0

4. Let $f(x) = ax + b/x$. Suppose a and b are positive. What happens to $f(x)$ as b increases?

   (a) The critical *points* move further apart.

   (b) The critical *points* move closer together.

   Answer: (a). Critical points are at $x = \pm\sqrt{b/a}$.

   SVC.04.02.040

   CC HZ MA131 F05: **80**/20
   CC HZ MA 122 S06: **75**/25
   CC KC MA131 F05: **87**/13
   CC HZ MA131 F06: **90**/10
   CC KC MA121 F06: **100**/0
   CC HZ MA131 F07: **93**/7 time 1:00
   CC JS MA131 F07: **81**/19 time 1:30
   CC KC MA121 F07: **96**/4 time 2:30
   CC HZ MA131 F09: **88**/12 time 1:00

CC HZ MA131 F10: **82**/18 time 1:30
CC TM MA122 S12: **100**
CC KC MA121A F11: **86**/14 "Individual, pre-discussion vote"
CC KC MA121A F11: **100**/0 Post small-group discussion vote
CC KC MA121D F11: **100**/0 time 2:45
CC HZ MA131 F11: **100**/0 time 1:40
CC HZ MA131 F12: **100**/0 time 1:00
CC KC MA131 F14: **95**/5 time 2:00
CC KC MA131 F15: **100**/0 time 1:00
CC KC MA131 S16: **96**/4 time 1:00
CC KC MA131 F16: **83**/17
CC KC MA131 S17: **94**/6

5. Let $f(x) = ax + b/x$. Suppose a and b are positive. What happens to $f(x)$ as b increases?

   (a) The critical *values* move further apart.

   (b) The critical *values* move closer together.

   Answer: (a). Critical values are at $y = \pm 2\sqrt{ab}$. Note that this question is the same as the above, but the answers are different, asking about critical values instead of points.

   SVC.04.02.050

   CC HZ MA131 F06: **70**/30
   CC KC MA121 F06: **74**/26
   CC HZ MA131 F07: **60**/40 time 2:30
   CC JS MA131 F07: **27**/73 time 1:30
   CC HZ MA131 F09: **52**/48 time 1:30
   CC HZ MA131 F10: **45**/55 time 2:00
   CC TM MA122 S12: **50**/50
   CC HZ MA131 F11: **81**/19 time 4:00
   CC HZ MA131 F12: **78**/22 time 2:45
   CC KC MA131 F14: **77**/23 time 3:25
   CC KC MA131 F15: **38**/62 time 2:00 Rich discussion
   CC KC MA131 S16: **79**/21 time 2:15
   CC KC MA131 F16: **89**/11
   CC KC MA131 S17: **83**/17

6. Let $f(x) = ax + b/x$. Suppose a and b are positive. What happens to $f(x)$ as a increases?

   (a) The critical *points* move further apart.

(b) The critical *points* move closer together.

Answer: (b). We take the derivative to get $f'(x) = a - b/x^2$. We set this equal to zero, and solve for the critical points $x = \pm\sqrt{b/a}$. Thus as a increases, (b) the critical points get closer together.

SVC.04.02.060

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CC HZ MA131 F06: 0/**100**
CC KC MA121 F06: 82/**18**
CC HZ MA131 F07: 13/**87** time 1:10
CC JS MA131 F07: 40/**60** time 0:50
CC HZ MA131 F09: 25/**75** time 1:00
CC HZ MA131 F10: 5/**95** time 0:45
CC KC MA131 F15: 0/**100** time 1:45

7. Let $f(x) = ax + b/x$. Suppose a and b are positive. What happens to $f(x)$ as a increases?

   (a) The critical *values* move further apart.

   (b) The critical *values* move closer together.

   Answer: (a). We take the derivative to get $f'(x) = a - b/x^2$. We set this equal to zero, and solve for the critical points $x = \pm\sqrt{b/a}$. To get the critical values, we put these critical points into the function to get $f(\pm\sqrt{b/a}) = \pm 2\sqrt{ab}$. Thus as a increases, (a) The critical values move farther apart.

   SVC.04.02.070

   CC KC MA131 F05: **91**/9
   CC HZ MA131 F06: **50**/50
   CC HZ MA131 F07: **53**/47 time 0:40
   CC JS MA131 F07: **79**/21 time 0:25
   CC HZ MA131 F09: **92**/8 time 0:30
   CC HZ MA131 F10: **62**/38 time 0:30
   CC KC MA121A F11: **20**/80
   CC KC MA121D F11: **0**/100 time 1:40
   CC KC MA131 F15: **100**/0 time 2:00

8. Find a formula for a parabola with its vertex at (3,2) and with a second derivative of -4.

   (a) $y = -4x^2 + 48x - 106$.

   (b) $y = -4x^2 + 24x - 34$.

(c) $y = -2x^2 + 12x - 16$.

(d) $y = -2x^2 + 4x + 8$.

Answer: (c). Any parabola can be written in the form $y = ax^2 + bx + c$. We know that the second derivative is -4, so $a = -2$. We know that the vertex is at $(3, 2)$, so this means that $y'(3) = 0$. Thus $-4(3) + b = 0$, and so $b = 12$. Finally we know that $y(3) = 2 = -4 \cdot 3^2 + 12 \cdot 3 + c = 2$, and so $c = -16$.

SVC.04.02.080

CC LV MA121A S09: 0/30/**65**/5 time 3:00
CC LV MA121B S09: 0/5/**95**/0 time 3:00
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CC HZ MA131 F12: 0/0/**41**/59 time 4:15
CC KC MA131 F14: 0/0/**100**/0 time 4:30
CC KC MA131 S15: 0/4/**88**/8
CC KC MA131 F15: 0/6/**88**/6 time 3:30
CC KC MA131 S16: 8/0/**59**/33 time 3:45
CC KC MA131 F16: 6/0/**88**/6
CC KC MA131 S17: 0/0/**83**/17