

# Classroom Voting Questions: Calculus I

## 4.2 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.

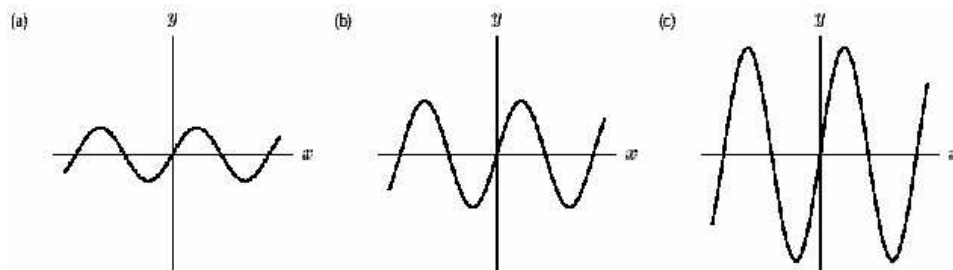


Figure 4.4

Answer: (c).

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

SVC.04.02.010

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.

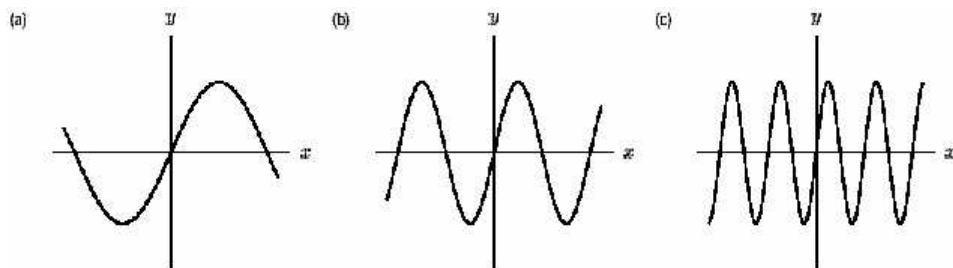


Figure 4.5

Answer: (c).

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

SVC.04.02.020

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 critical points

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

CC HZ MA131 F05: 10/**40**/40/**10**  
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

SVC.04.02.030

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  $x = \pm\sqrt{b/a}$ .

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

SVC.04.02.040

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

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

SVC.04.02.050

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).*

CC KC MA131 F05: 4/**96**  
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

SVC.04.02.060

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).*

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

SVC.04.02.070

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  $c = -16$ .

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CC LV MA121B S09: 0/5/**95**/0 time 3:00

SVC.04.02.080