1. Evaluate $e^{-0.145}$ to four decimal places.

   A. -1.9310

   (B) 0.8650

   C. 1.1560

   D. 2.5090

   E. It does not exist

2. If \$16,100 is invested in an account with an interest rate of 4.5% that is compounded continuously, determine the balance in the account after 5 years.

   A. \$21,841.66

   B. \$12,856.11

   C. \$19,179.06

   (D) \$20,162.40

   E. \$22,961.51

   $A = Pe^{rt}$ $r = .045$, $t = 5$, $P = 16,100$

   $16,100e^{(.045)(5)} \sim 20,162.40$

3. Find the minimum value of the function $f(x) = 3x^2 - 18x - 9$

   A. 18

   (B) -36

   C. 3

   D. 72

   E. 90

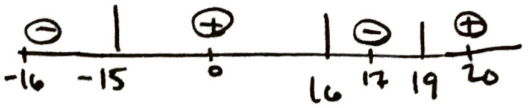
   $f\left(-\frac{b}{2a}\right)$ $-\frac{b}{2a} = \frac{18}{2(3)} = \frac{18}{6} = 3$

   $f(3) = 3(3)^2 - 18(3) - 9 = -36$

4. Find all intervals on which $f(x) > 0$, where

$$f(x) = (x-16)(x-19)(x+15)$$

(A) $(-15, 16) \cup (19, \infty)$
B. $(-15, 16) \cup (16, 19)$
C. $(16, 19) \cup (19, \infty)$
D. $(-\infty, -15) \cup (16, 19)$
E. $(-\infty, -15) \cup (19, \infty)$



test	$x-16$	$x-19$	$x+15$	$f(x)$
-16	$-$	$-$	$-$	$-$
0	$-$	$-$	$+$	$+$
17	$+$	$-$	$+$	$-$
20	$+$	$+$	$+$	$+$

5. Which of the following is true for the given rational function?

$$f(x) = \frac{x^3 + 8x^2 + 16x}{x^2 - 4x + 3}$$

A. There is one hole, one vertical asymptote, and one horizontal asymptote
(B) There are two vertical asymptotes and one slant asymptote
C. There is one hole, one vertical asymptote, and one slant asymptote
D. There are two vertical asymptotes and one horizontal asymptote
E. There are two holes and one slant asymptote

deg(top) = deg(bottom) + 1 $\Rightarrow$ SA

$0 = x^2 - 4x + 3 = (x-1)(x-3) \Rightarrow$ VA @ $x=1$, $x=3$

6. At a price of \$380, an airline can sell 250 tickets per day. It is determined taht for every \$20 increase in ticket price, 5 fewer tickets will be sold. At what price should the airline sell the tickets to maximize revenue?

(A) \$690
B. \$630
C. \$750
D. \$710
E. \$650

n = # of \$20 increases $R = pq$ (p = price, q = quantity)

$p = 380 + 20n$
$q = 250 - 5n$

$R = (380+20n)(250-5n)$
$= 95000 + 3100n - 100n^2$

$\frac{-3100}{2(-100)} = 15.5$

$p = 380 + 20(15.5) = 690$

7. Find the x-value at which the graph of $f(x)$ crosses its horizontal asymptote.

$$f(x) = \frac{7x^2 - 2x + 4}{x^2 + 8x + 9}$$

HA = 7

(A) $-\frac{59}{58}$
B. $\frac{1}{2}$
C. $\frac{9}{2}$
D. $\frac{3}{5}$
E. $-\frac{2}{15}$

$$\frac{7x^2 - 2x + 4}{x^2 + 8x + 9} = 7$$

$$7x^2 - 2x + 4 = 7x^2 + 56x + 63$$

$$-59 = 58x$$

$$\boxed{\frac{-59}{58} = x}$$

8. How much money should be invested in an account that has an interest rate of 2.05% compounded continuously so that at the end of 22 years it has a balance of \$49,000?

A. \$23,345.87
B. \$25,640.17
C. \$28,395.21
D. \$42,658.23
(E) \$31,212.55

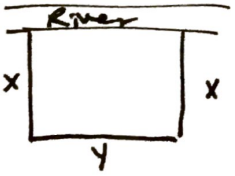
$A = Pe^{rt}$

$r = .0205$
$t = 22$
$A = 49{,}000$
$P = ?$

$$\frac{49{,}000}{e^{(.0205)(22)}} \approx \boxed{31{,}212.55}$$

9. You have 2800 feet of fencing available to enclose a rectangular plot of land with one side along a river. No fencing is to be used on the side of the field containing the river. Find the length of the shortest side of the fencing that will maximize the area of the enclosed field.

(A) 700 feet
B. 350 feet
C. 1400 feet
D. 560 feet
E. 175 feet



$P = 2800 = 2x + y$

$\Rightarrow y = 2800 - 2x$

$A = xy = x(2800 - 2x) = 2800x - 2x^2$

$$-\frac{b}{2a} = \frac{-2800}{(-2)(2)} = \boxed{700 = x}$$

$y = 2800 - 2(700) = 1400$

10. A projectile is fired upward with an initial velocit of 416 feet per second. The height of the projectile is given by the equation $h(t) = -16t^2 + 416t + 65$. Find the maximum height of the projectile.

$h\left(\frac{-b}{2a}\right)$

A. 2804 feet

B. 2769 feet

C. 2754 feet

D. 2749 feet

E. 2779 feet

$\frac{-b}{2a} = \frac{-416}{2(-16)} = 13$

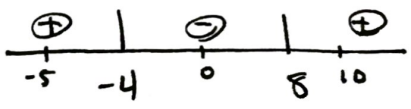
$h(13) = -16(13)^2 + 416(13) + 65 = 2769$

11. Find all intervals on which $f(x) > 0$.

$$f(x) = \frac{3x + 12}{x - 8}$$

Set $3x+12 = 0$, $x - 8 = 0$

$x = -4$, $x = 8$



A. $(-4, 8)$

B. $(8, \infty)$

C. $(-\infty, -4) \cup (8, \infty)$

D. $(-4, 8) \cup (8, \infty)$

E. $(-\infty, -4) \cup (-4, 8) \cup (8, \infty)$

12. Find all of the horizontal asymptotes of $f(x) = \dfrac{4x + 8}{x^2 + 8x + 12}$

deg top > deg bottom

$\Rightarrow$ HA = 0.

A. $y = -2$

B. $y = 0$

C. $y = 2$

D. $y = -6$

E. $y = -6, y = -2$

13. Find the inverse function $f^{-1}(x)$ of the function $f(x) = \dfrac{x+4}{x-7}$

A. $f^{-1}(x) = \dfrac{x+7}{x-4}$

B. $f^{-1}(x) = \dfrac{x-4}{x+7}$

C. $f^{-1}(x) = \dfrac{x-7}{x+4}$

D. $f^{-1}(x) = \dfrac{7x-1}{7x+4}$

(E.) $f^{-1}(x) = \dfrac{7x+4}{x-1}$

$x = \dfrac{y+4}{y-7}$

$x(y-7) = y+4$

$xy - 7x = y+4$

$xy - y = 7x+4$

$(x-1)y = 7x+4$

$y = \dfrac{7x+4}{x-1}$

14. Simplify the expression.

$$(e^{3x} + e^{-3x})(e^{3x} - e^{-3x})$$

A. $e^{9x} - e^{-9x}$

B. $e^{6x} - 2 + e^{-6x}$

C. $e^{9x^2} - e^{-9x^2}$

D. $e^{9x} - 2 + e^{-9x}$

(E.) $e^{6x} - e^{-6x}$

$e^{6x} - e^{3x-3x} + e^{-3x+3x} - e^{-3x-3x}$

$= e^{6x} - e^{-6x}$

15. For the function $f(x) = \sqrt{x^2 - 36}$ find the **range** of the inverse function $f^{-1}(x)$.

A. $[0, \infty)$

B. $[-6, 6]$

(C.) $(-\infty, -6] \cup [6, \infty)$

D. $[6, \infty)$

E. $(-\infty, \infty)$

= domain of f

$D: (-\infty, -6] \cup [6, \infty)$ (include ± 6 since this gives $\sqrt{0} = 0$)