Honors Math 3

Midterm Review

1) Nicole invests $6,746 in a retirement account with a fixed annual interest rate of 8% compounded continuously. What will the account balance be after 19 years?

2) Mike invests $2,953 in a retirement account with a fixed annual interest rate of 6% compounded monthly. What will the account balance be after 13 years?

3) Stephanie invests $4,375 in a retirement account with a fixed annual interest rate of 9% compounded semiannually. How long will it take for the account balance to reach $19,976.27?

4) Carlos invests $1,565 in a savings account with a fixed annual interest rate of 7% compounded continuously. How long will it take for the account balance to reach $3,380.03?

5) Totsakan invests $5,320 in a retirement account with a fixed annual interest rate compounded continuously. After 19 years, the balance reaches $7,779.35. What is the interest rate of the account?

6) Ndiba invests a sum of money in a savings account with a fixed annual interest rate of 3% compounded quarterly. After 6 years, the balance reaches $5,142.19. What was the amount of the initial investment?

Divide. Write your answer in fraction form.

7) $(5x^3 - 30x^2 - 2x + 5) \div (x - 6)$

8) $(6x^3 + 28x^2 - 11x) \div (x + 5)$

9) $(15x^3 + 7x^2 - 10x - 19) \div (5x - 6)$

10) $(3x^4 + 8x^3 - 3x^2 - 6x + 9) \div (x - 1)$

Solve each equation.

11) $2^{3-3n} = 64$

12) $5^{-n+3} = 125$

13) $625^{x} = 125^{-x-2}$

14) $4^{-2n+1} \cdot 2^2 = \left(\frac{1}{64}\right)^{2n}$

15) $\frac{8^{2x}}{16^{-x}} = 2^3$

16) $16 \cdot 64^{-a} = 16^{-a}$

17) $-3 \cdot 10^{-6v} = -32$

18) $4 \cdot 8^{x+4} = 18$

19) $9e^{m} - 5 = 67$

20) $-e^{n} - 5.6 = -59$

21) $\ln(4b + 3) = \ln(5b + 2)$

22) $\ln(5n - 4) = \ln 16$

23) $\log_{18}(x^2 - 46) = \log_{18}(2x + 2)$

24) $\log_{19}(v^2 - 7v) = \log_{19}(16 - v)$

25) $\log_{3}(x + 2) - 9 = -10$

26) $\log_{2}(v + 5) - 2 = -4$

27) $\ln 2x^2 - \ln 2 = 4$

28) $\ln 3 - \ln(x + 8) = 5$

29) $\ln(x + 16) + \ln x = \ln 80$

30) $\ln 2x^2 - \ln 6 = \ln 27$

31) $\ln 2x^2 - \ln 8 = 4$

32) $\log_{8}(x^2 + 2) - \log_{8} 3 = \log_{8} 34$

33) $\log_{5} 8 - \log_{5}(x - 9) = 1$

34) $\log_{5}(x + 5) - \log_{5} x = \log_{5} 61$

Use a graphing calculator to approximate all points of relative and absolute extrema of each function.

35) $f(x) = x^4 - 3x^2 + 4$

36) $f(x) = -x^3 + 3x^2 + 3$

Use a graphing calculator to approximate the open intervals where each function is increasing and decreasing.

37) $f(x) = x^3 - 4x^2 + 6$

38) $f(x) = -x^4 + 2x^2 + 3$

Find the inverse of each function.

39) $f(x) = \frac{5}{8}x - \frac{25}{8}$

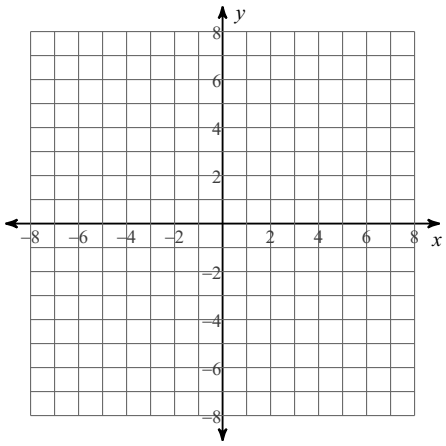
40) $f(x) = \frac{-4 + x}{4}$

41) $f(x) = \frac{3}{x + 2}$

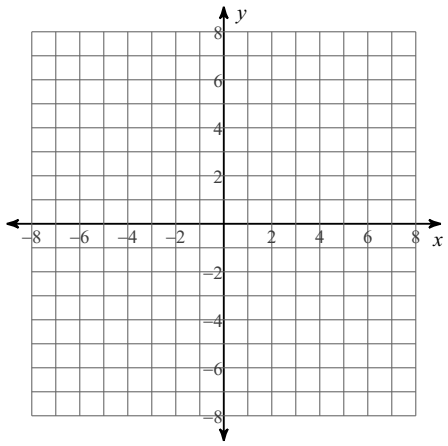
42) $g(x) = \sqrt[3]{x + 1} - 1$

Sketch the graph of each function.

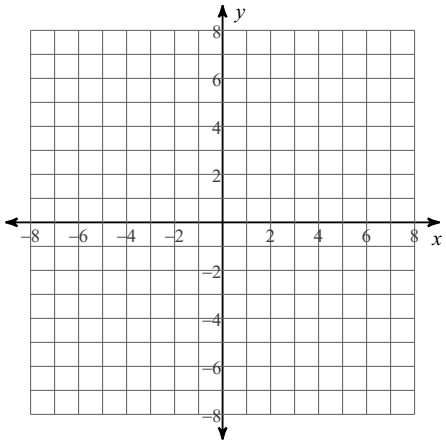
43) $f(x) = \begin{cases} (x+2)^2, & x < -2 \\ -|x|, & -2 \le x < 4 \\ (x-4)^2, & x \ge 4 \end{cases}$



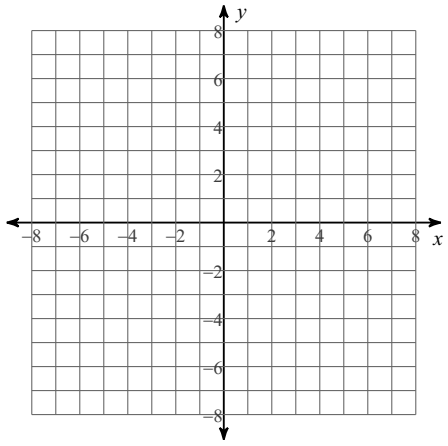
44) $h(x) = \begin{cases} \sqrt{x}, & x < 2 \\ -x + 1, & x \ge 2 \end{cases}$



45) $g(x) = \begin{cases} 4 - x^2, & x < 2 \\ -x - 2, & x > 2 \end{cases}$



46) $f(x) = \begin{cases} |x+4|, & x < -2 \\ |x-3|, & -2 \le x \le 3 \\ -2, & x > 3 \end{cases}$



State the number of complex zeros, the possible number of real and imaginary zeros, and the possible rational zeros for each function. Then find all zeros.

47) $f(x) = x^3 + 4x^2 + 4x + 16$

48) $f(x) = x^3 + 4x^2 + 2x + 8$

49) $f(x) = x^3 + 5x^2 + 3x + 15$

50) $f(x) = x^4 - 7x^2 - 18$

Find the lateral area of each figure. Round your answers to the nearest hundredth, if necessary. Leave your answers in terms of π for answers that contain π.

51) A pyramid with slant height 7 yd whose triangular base measures 2 yd on each side. Each altitude of the base measures 1.7 yd.

52) A square prism measuring 5 km along each edge of the base and 10 km tall.

53) A cylinder with a diameter of 10 m and a height of 3 m.

54) A cone with radius 2 in and a slant height of 6.3 in.

55) A prism 12 ft tall with a right triangle for a base with side lengths 6 ft, 8 ft, and 10 ft.

56) A hexagonal prism 8 in tall with a regular base measuring 12 in on each edge and an apothem of length 10.4 in.

Find the surface area of each figure. Round your answers to the nearest hundredth, if necessary. Leave your answers in terms of π for answers that contain π.

57) A cone with radius 7 m and a slant height of 15.7 m.

58) A sphere with a diameter of 18 mi.

59) A square pyramid measuring 7 yd along the base with a slant height of 6.1 yd.

60) A sphere with a diameter of 7.8 in.

61) A square prism measuring 10 mi along each edge of the base and 2 mi tall.

62) A hexagonal prism 10 cm tall with a regular base measuring 8 cm on each edge and an apothem of length 6.9 cm.

Find the volume of each figure. Round your answers to the nearest hundredth, if necessary. Leave your answers in terms of π for answers that contain π.

63) A sphere with a diameter of 4 mi.

64) A cylinder with a diameter of 18 cm and a height of 9 cm.

65) A cone with diameter 16 yd and a height of 16 yd.

66) A hexagonal prism 6 in tall with a regular base measuring 12 in on each edge and an apothem of length 10.4 in.

Honors Math 3

Midterm Review

1) Nicole invests $6,746 in a retirement account with a fixed annual interest rate of 8% compounded continuously. What will the account balance be after 19 years?

$30,844.23

2) Mike invests $2,953 in a retirement account with a fixed annual interest rate of 6% compounded monthly. What will the account balance be after 13 years?

$6,429.38

3) Stephanie invests $4,375 in a retirement account with a fixed annual interest rate of 9% compounded semiannually. How long will it take for the account balance to reach $19,976.27?

17 years

4) Carlos invests $1,565 in a savings account with a fixed annual interest rate of 7% compounded continuously. How long will it take for the account balance to reach $3,380.03?

11 years

5) Totsakan invests $5,320 in a retirement account with a fixed annual interest rate compounded continuously. After 19 years, the balance reaches $7,779.35. What is the interest rate of the account?

2%

6) Ndiba invests a sum of money in a savings account with a fixed annual interest rate of 3% compounded quarterly. After 6 years, the balance reaches $5,142.19. What was the amount of the initial investment?

$4,298

Divide. Write your answer in fraction form.

7) $(5x^3 - 30x^2 - 2x + 5) \div (x - 6)$

$5x^2 - 2 - \frac{7}{x - 6}$

8) $(6x^3 + 28x^2 - 11x) \div (x + 5)$

$6x^2 - 2x - 1 + \frac{5}{x + 5}$

9) $(15x^3 + 7x^2 - 10x - 19) \div (5x - 6)$

$3x^2 + 5x + 4 + \frac{5}{5x - 6}$

10) $(3x^4 + 8x^3 - 3x^2 - 6x + 9) \div (x - 1)$

$3x^3 + 11x^2 + 8x + 2 + \frac{11}{x - 1}$

Solve each equation.

11) $2^{3-3n} = 64$

$\{-1\}$

12) $5^{-n+3} = 125$

$\{0\}$

13) $625^{x} = 125^{-x-2}$

$\left\{-\frac{6}{7}\right\}$

14) $4^{-2n+1} \cdot 2^2 = \left(\frac{1}{64}\right)^{2n}$

$\left\{-\frac{1}{2}\right\}$

15) $\frac{8^{2x}}{16^{-x}} = 2^3$

$\left\{\frac{3}{10}\right\}$

16) $16 \cdot 64^{-a} = 16^{-a}$

$\{2\}$

17) $-3 \cdot 10^{-6v} = -32$

-0.1713

18) $4 \cdot 8^{x+4} = 18$

-3.2767

19) $9e^{m} - 5 = 67$

2.0794

20) $-e^{n} - 5.6 = -59$

3.9778

21) $\ln(4b + 3) = \ln(5b + 2)$

$\{1\}$

22) $\ln(5n - 4) = \ln 16$

$\{4\}$

23) $\log_{18}(x^2 - 46) = \log_{18}(2x + 2)$

$\{8\}$

24) $\log_{19}(v^2 - 7v) = \log_{19}(16 - v)$

$\{-2, 8\}$

25) $\log_{3}(x + 2) - 9 = -10$

$\left\{-\frac{5}{3}\right\}$

26) $\log_{2}(v + 5) - 2 = -4$

$\left\{-\frac{19}{4}\right\}$

27) $\ln 2x^2 - \ln 2 = 4$

$\{e^2, -e^2\}$

28) $\ln 3 - \ln(x + 8) = 5$

$\left\{\frac{3 - 8e^5}{e^5}\right\}$

29) $\ln(x + 16) + \ln x = \ln 80$

$\{4\}$

30) $\ln 2x^2 - \ln 6 = \ln 27$

$\{9, -9\}$

31) $\ln 2x^2 - \ln 8 = 4$

$\{2e^2, -2e^2\}$

32) $\log_{8}(x^2 + 2) - \log_{8} 3 = \log_{8} 34$

$\{10, -10\}$

33) $\log_{5} 8 - \log_{5}(x - 9) = 1$

$\left\{\frac{53}{5}\right\}$

34) $\log_{5}(x + 5) - \log_{5} x = \log_{5} 61$

$\left\{\frac{1}{12}\right\}$

Use a graphing calculator to approximate all points of relative and absolute extrema of each function.

35) $f(x) = x^4 - 3x^2 + 4$

Absolute minima: $(-1.2, 1.8), (1.2, 1.8)$

Relative maximum: $(0, 4)$

36) $f(x) = -x^3 + 3x^2 + 3$

Relative minimum: $(0, 3)$

Relative maximum: $(2, 7)$

Use a graphing calculator to approximate the open intervals where each function is increasing and decreasing.

37) $f(x) = x^3 - 4x^2 + 6$

Increasing: $(-\infty, 0), (2.7, \infty)$ Decreasing: $(0, 2.7)$

38) $f(x) = -x^4 + 2x^2 + 3$

Increasing: $(-\infty, -1), (0, 1)$ Decreasing: $(-1, 0), (1, \infty)$

Find the inverse of each function.

39) $f(x) = \frac{5}{8}x - \frac{25}{8}$

$f^{-1}(x) = 5 + \frac{8}{5}x$

40) $f(x) = \frac{-4 + x}{4}$

$f^{-1}(x) = 4x + 4$

41) $f(x) = \frac{3}{x + 2}$

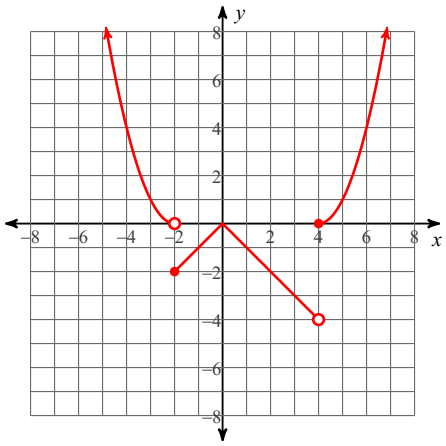
$f^{-1}(x) = \frac{3}{x} - 2$

42) $g(x) = \sqrt[3]{x + 1} - 1$

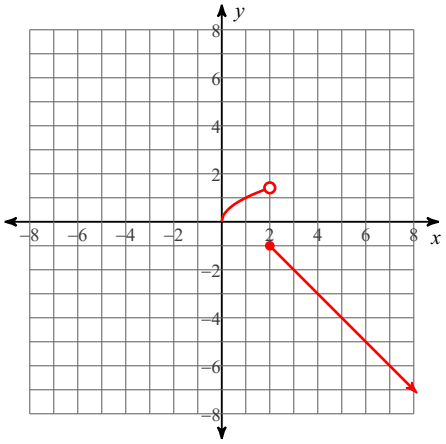
$g^{-1}(x) = (x + 1)^3 - 1$

Sketch the graph of each function.

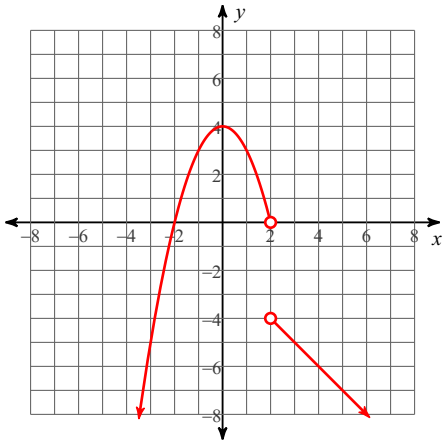
43) $f(x) = \begin{cases} (x+2)^2, & x < -2 \\ -|x|, & -2 \le x < 4 \\ (x-4)^2, & x \ge 4 \end{cases}$



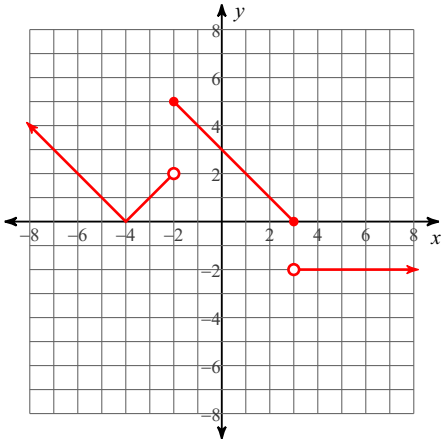
44) $h(x) = \begin{cases} \sqrt{x}, & x < 2 \\ -x+1, & x \ge 2 \end{cases}$



45) $g(x) = \begin{cases} 4-x^2, & x < 2 \\ -x-2, & x > 2 \end{cases}$



46) $f(x) = \begin{cases} |x+4|, & x < -2 \\ |x-3|, & -2 \le x \le 3 \\ -2, & x > 3 \end{cases}$



State the number of complex zeros, the possible number of real and imaginary zeros, and the possible rational zeros for each function. Then find all zeros.

47) $f(x) = x^3 + 4x^2 + 4x + 16$

# of complex zeros: 3
Possible # of real zeros: 3 or 1
Possible # of imaginary zeros: 2 or 0
Possible rational zeros: $\pm 1, \pm 2, \pm 4, \pm 8, \pm 16$
Zeros: $\{-4, 2i, -2i\}$

48) $f(x) = x^3 + 4x^2 + 2x + 8$

# of complex zeros: 3
Possible # of real zeros: 3 or
Possible # of imaginary zeros
Possible rational zeros: $\pm 1, \pm$
Zeros: $\{-4, i\sqrt{2}, -i\sqrt{2}\}$

49) $f(x) = x^3 + 5x^2 + 3x + 15$

# of complex zeros: 3
Possible # of real zeros: 3 or 1
Possible # of imaginary zeros: 2 or 0
Possible rational zeros: $\pm 1, \pm 3, \pm 5, \pm 15$
Zeros: $\{-5, i\sqrt{3}, -i\sqrt{3}\}$

50) $f(x) = x^4 - 7x^2 - 18$

# of complex zeros: 4
Possible # of real zeros: 4, 2, or 0
Possible # of imaginary zeros: 4,
Possible rational zeros:
$\pm 1, \pm 2, \pm 3, \pm 6, \pm 9, \pm 18$
Zeros: $\{\sqrt{2}, -i\sqrt{2}$

Find the lateral area of each figure. Round your answers to the nearest hundredth, if necessary. Leave your answers in terms of π for answers that contain π.

51) A pyramid with slant height 7 yd whose triangular base measures 2 yd on each side. Each altitude of the base measures 1.7 yd.

21 yd^2

52) A square prism measuring 5 km along each edge of the base and 10 km tall.

200 km^2

53) A cylinder with a diameter of 10 m and a height of 3 m.

30π m^2

54) A cone with radius 2 in and a slant height of 6.3 in.

12.6π in^2

55) A prism 12 ft tall with a right triangle for a base with side lengths 6 ft, 8 ft, and 10 ft.

288 ft^2

56) A hexagonal prism 8 in tall with a regular base measuring 12 in on each edge and an apothem of length 10.4 in.

576 in^2

Find the surface area of each figure. Round your answers to the nearest hundredth, if necessary. Leave your answers in terms of π for answers that contain π.

57) A cone with radius 7 m and a slant height of 15.7 m.

158.9π m^2

58) A sphere with a diameter of 18 mi.

324π mi^2

59) A square pyramid measuring 7 yd along the base with a slant height of 6.1 yd.

134.4 yd^2

60) A sphere with a diameter of 7.8 in.

60.84π in^2

61) A square prism measuring 10 mi along each edge of the base and 2 mi tall.

280 mi^2

62) A hexagonal prism 10 cm tall with a regular base measuring 8 cm on each edge and an apothem of length 6.9 cm.

811.2 cm^2

Find the volume of each figure. Round your answers to the nearest hundredth, if necessary. Leave your answers in terms of π for answers that contain π.

63) A sphere with a diameter of 4 mi.

10.67π mi^3

64) A cylinder with a diameter of 18 cm and a height of 9 cm.

729π cm^3

65) A cone with diameter 16 yd and a height of 16 yd.

341.33π yd^3

66) A hexagonal prism 6 in tall with a regular base measuring 12 in on each edge and an apothem of length 10.4 in.

2246.4 in^3