Last Name:_____ First Name:_____

1.) False

2.) True

3.) False

4.) True

5.) True

6.) True

7.) True

8.) False

9.) -8

10.) 4

11.) $f^{-1}(y) = \left(\frac{y-3}{4}\right)^3 - 1$

12.) $\left[\frac{5}{3}, \infty\right)$

13.) 0

14.) $2x^2 - 3x + 4 + \frac{x+1}{3x^2+2}$

15.) $2x^2 - 11x + 22 + \frac{-43}{x+2}$

16.) 2

17.) $4(x+\frac{1}{2})^2 - 4$

18.) 2

19.) $1+\sqrt{11}$ and $1-\sqrt{11}$

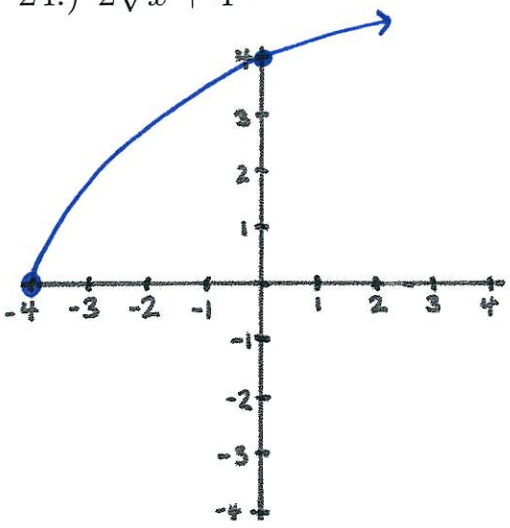
20.) 2

21.) $2(x-2)(x+3)(x-\frac{1}{2})$

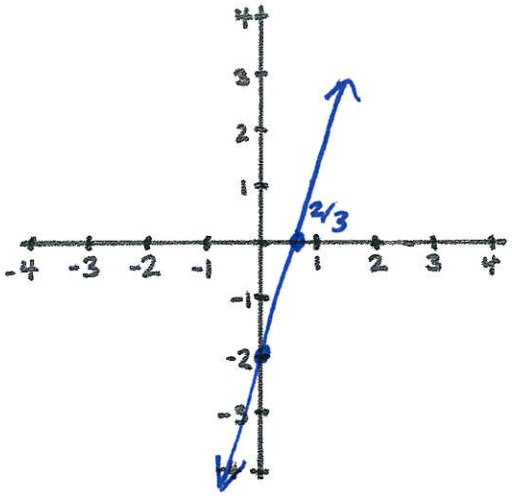
22.) $2(x+2)(x^2+x+2)$

23.) $(x+1)$, $(x-4)$

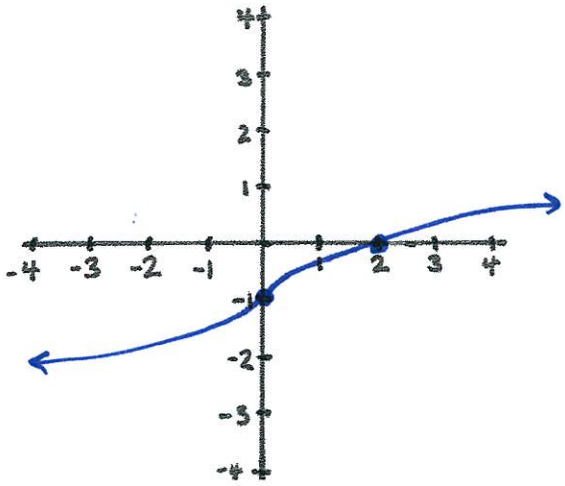
24.) $2\sqrt{x+4}$



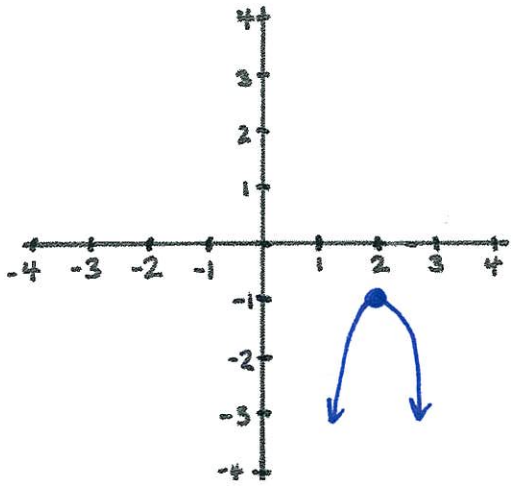
26.) $3x-2$



25.) $\sqrt[3]{\frac{x}{2}}-1$



27.) $-2(x-2)^2-1$



Second Exam

True/False

For #1-8 write the entire word "True" or the entire word "False".

1.) $(x+y)^n = x^n + y^n$

2.) $\sqrt[n]{\frac{x}{y}} = \frac{\sqrt[n]{x}}{\sqrt[n]{y}}$

3.) $\sqrt[n]{x+y} = \sqrt[n]{x} + \sqrt[n]{y}$

4.) $(xy)^n = x^n y^n$

5.) $\sqrt[n]{xy} = \sqrt[n]{x}\sqrt[n]{y}$

6.) $(\frac{x}{y})^n = \frac{x^n}{y^n}$

7.) $a(b+c) = ab + ac$

8.) $3x^3 - 4x^2 + x - 2$ has 4 roots.

****

Algebra

9.) Find x where $(x+5)^3 + 20 = -7$.

$(x+5)^3 = -27$

$x+5 = \sqrt[3]{-27} = -3$

$x = -3-5 = -8$

10.) If $g(x)$ is an invertible function, and $g(4) = 8$, then what is $g^{-1}(8)$?

11.) Find the inverse of $f(x) = 4\sqrt[3]{x+1} + 3$. (You can check your answer by seeing if $f^{-1} \circ f(x) = x$.)

$y = 4\sqrt[3]{x+1} + 3$

$y - 3 = 4\sqrt[3]{x+1}$

$\frac{y-3}{4} = \sqrt[3]{x+1}$

$\left(\frac{y-3}{4}\right)^3 = x+1$

$x = \left(\frac{y-3}{4}\right)^3 - 1$

$f^{-1}(y) = \left(\frac{y-3}{4}\right)^3 - 1$

12.) What is the implied domain of $g(x) = -\sqrt[2]{3x-5} + 18x^2 - 3$? (Write your answer as an interval.)

$3x - 5 \geq 0$

$3x \geq 5$

$x \geq 5/3$

$[5/3, \infty)$

13.) Suppose that $a \neq 0$ and that $b^2 - 4ac \geq 0$. Write the following number as an integer in standard form:

$$a\left(\frac{-b - \sqrt{b^2 - 4ac}}{2a}\right)^2 + b\left(\frac{-b - \sqrt{b^2 - 4ac}}{2a}\right) + c$$

0

14.) Find $\dfrac{6x^4 - 9x^3 + 16x^2 - 5x + 9}{3x^2 + 2}$

$$
\begin{array}{r|l}
3x^2+2 & 2x^2 - 3x + 4 \\
\hline
 & 6x^4 - 9x^3 + 16x^2 - 5x + 9 \\
 & 6x^4 \qquad + 4x^2 \\
\hline
 & -9x^3 + 12x^2 - 5x + 9 \\
 & -9x^3 \qquad - 6x \\
\hline
 & 12x^2 + x + 9 \\
 & 12x^2 \qquad + 8 \\
\hline
 & x + 1
\end{array}
$$

15.) Find $\dfrac{2x^3 - 7x^2 + 1}{x + 2}$

$$
\begin{array}{r|cccc}
-2 & 2 & -7 & 0 & 1 \\
 & & -4 & 22 & -44 \\
\hline
 & 2 & -11 & 22 & -43
\end{array}
$$

16.) What is the slope of the straight line in $\mathbb{R}^2$ that passes through the points $(4, 3)$ and $(6, 7)$?

$$\frac{7-3}{6-4} = \frac{4}{2} = 2$$

17.) Complete the square: Write $4x^2 + 4x - 3$ in the form $\alpha(x+\beta)^2 + \gamma$ where $\alpha, \beta, \gamma \in \mathbb{R}$.

$$4\left(x + \frac{4}{2\cdot 4}\right)^2 - 3 - \frac{4^2}{4(4)} = 4\left(x+\tfrac{1}{2}\right)^2 - 3 - 1$$
$$= 4\left(x+\tfrac{1}{2}\right)^2 - 4$$

18.) How many roots does $3x^2 - 2x - 10$ have?

$$(-2)^2 - 4(3)(-10) = 4 + 120 > 0$$
so 2 roots.

19.) Find the roots of $x^2 - 2x - 10$

$$\frac{2 \pm \sqrt{(-2)^2 - 4(1)(-10)}}{2(1)} = \frac{2 \pm \sqrt{44}}{2} = \frac{2 \pm 2\sqrt{11}}{2}$$
$$= 1 \pm \sqrt{11}$$

20.) Find a root of $3x^3 - 4x^2 - 3x - 2$

$$3(2)^3 - 4(2)^2 - 3(2) - 2 = 24 - 16 - 6 - 2$$
$$= 0$$

21.) (2 points) Completely factor $2x^3 + x^2 - 13x + 6$. (Hint: 2 is a root.) (Your answer should be a product of a constant and maybe some linear and quadratic polynomials that have leading coefficients equal to 1, and such that any of the quadratics in the product have no roots.)

$$\begin{array}{c|cccc} 2 & 2 & 1 & -13 & 6 \\ & & 4 & 10 & -6 \\ \hline & 2 & 5 & -3 & 0 \end{array}$$

$2x^3+x^2-13x+6$

$(x-2)$ $(2x^2+5x-3)$

$2(x+3)$ $(x-\frac{1}{2})$

Discriminant of $2x^2+5x-3$ is $5^2-4(2)(-3)=25+24=49$

Roots are

$$\frac{-5\pm\sqrt{49}}{2(2)}=\frac{-5\pm 7}{4}$$

$\frac{-5-7}{4}=\frac{-12}{4}=-3$

$\frac{-5+7}{4}=\frac{2}{4}=\frac{1}{2}$

So completely factored form is $2x^2+5x-3=2(x+3)(x-\frac{1}{2})$

22.) (2 points) Completely factor $2x^3 + 6x^2 + 8x + 8$. (Hint: -2 is a root.) (Your answer should have the same form as described in #21.)

$$\begin{array}{c|cccc} -2 & 2 & 6 & 8 & 8 \\ & & -4 & -4 & -8 \\ \hline & 2 & 2 & 4 & 0 \end{array}$$

$2x^3+6x^2+8x+8$

$(x+2)$ $(2x^2+2x+4)$

(2) (x^2+x+2)

Discriminant of $2x^2+2x+4$ is $(2)^2-4(2)(4)=4-32<0$ so no roots.

Completely factored form is $2x^2+2x+4=2(x^2+x+2)$

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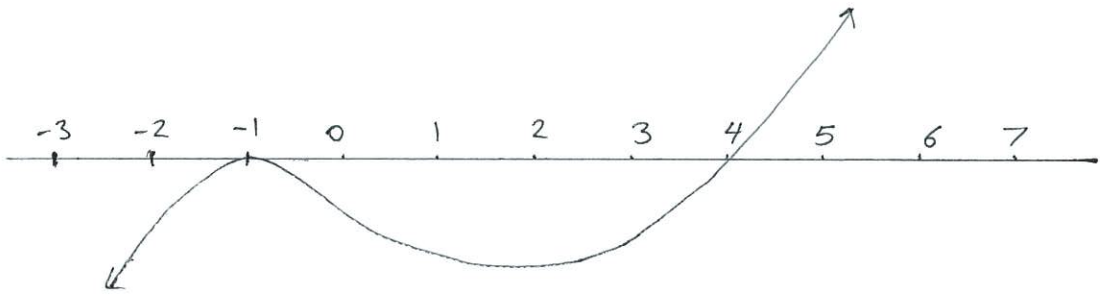
Graphs

23.) List all of the monic linear factors of $p(x)$ that you know of from the graph below.



roots: $-1, 4$

factors: $x+1$, $x-4$

24.) Graph $2\sqrt{x+4}$ and label its x- and y-intercepts.

stretch vert. by 2

shift left 4

x-int: $2\sqrt{x+4}=0 \Rightarrow x=-4$

y-int: $2\sqrt{0+4}=4$

25.) Graph $\sqrt[3]{\frac{x}{2}}-1$ and label its x- and y-intercepts.

stretch hor. by 2

shift down 1

x-int: $\sqrt[3]{\frac{x}{2}}-1=0 \Rightarrow x=2$

y-int: $\sqrt[3]{\frac{0}{2}}-1=-1$

26.) Graph $3x-2$ and label its x- and y-intercepts.

x-int: $3x-2=0 \Rightarrow x=\frac{2}{3}$

y-int: $3\cdot 0-2=-2$

27.) Graph $-2(x-2)^2-1$ and label its vertex. (You don't have to be accurate with the x- and y-intercepts.)

parabola opens down

shift right 2

shift down 1.