MATH 1010-2: PRACTICE FINAL[1]

December, 2010

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1. Solve for x:

$$7x - 2(x-3) = 26.$$

Solution. Distribute the -2 through (being careful with signs!) to obtain

$$7x - 2x + 6 = 26,$$

or

$$5x = 20.$$

So $x = 4$.

1*. Solve for x:

$$\frac{x}{x-1} = 6.$$

Solution. Clear the denominator by multiplying both sides by $x-1$ to obtain

$$x = 6(x-1) = 6x - 6.$$

So

$$5x = 6,$$

and $x = 6/5$.

1**. Solve for x:

$$-2(2-x) - 3x = 16.$$

Solution. Distribute the -2 through (again being careful with the signs!) to obtain

$$-4 + 2x - 3x = 16.$$

So

$$-x = 20,$$

and $x = -20$.

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2. Simplify

$$\frac{\frac{1}{5} - \frac{1}{6}}{\frac{2}{3}}$$

[1]There are more problems on this practice final than on the actual final exam. To get a feel for the length of the actual exam, you should choose one problem numbered 1, one problem numbered 2, and so on.

Solution. We work inside the parenthesis first, and find a common denominator. The best we can do is $30 = 5 \cdot 6$. So we have

$$\begin{aligned}\frac{\frac{1}{5}-\frac{1}{6}}{\frac{2}{3}} &= \frac{\left(\frac{1}{5}\cdot\frac{6}{6}-\frac{1}{6}\cdot\frac{5}{5}\right)}{\frac{2}{3}} \\ &= \frac{\frac{6}{30}-\frac{5}{30}}{\frac{2}{3}} \\ &= \frac{\frac{1}{30}}{\frac{2}{3}}.\end{aligned}$$

Now we invert and multiply to get

$$\frac{1}{30}\cdot\frac{3}{2} = \frac{3}{60} = \frac{1}{20},$$

which is our final answer.

2*. Simplify

$$\frac{\left(2-\frac{3^4}{9}\right)}{\frac{1}{2}}$$

Solution. Using the order of operation rules (and inverting and multiplying at the last step), we have

$$\begin{aligned}\frac{\left(2-\frac{3^4}{9}\right)}{\frac{1}{2}} &= \frac{2-\frac{81}{9}}{\frac{1}{2}} \\ &= \frac{2-9}{\frac{1}{2}} \\ &= -7\cdot\frac{2}{1} = -14.\end{aligned}$$

2**. Simplify

$$\frac{1}{1-7/5}.$$

Solution. We first find a common denominator downstairs and then invert and multiply:

$$\begin{aligned}\frac{1}{1-7/5} &= \frac{1}{5/5-7/5} \\ &= \frac{1}{-2/5} \\ &= 1\cdot(-5/2) = -5/2.\end{aligned}$$

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3. A hiker travels 3 miles east before turning and traveling due south to his destination. If he ends up 5 miles (as the crow flies) from his starting point, how far did he travel on the southbound leg of his hike?

Solution. The problem describes a right triangle with one leg equal to 3 and with hypotenuse equal to 5. We seek the length of the other leg. By the Pythagorean Theorem, it equals

$$\sqrt{5^2 - 3^2} = 4.$$

3*. The KSL tower is 80 meters tall. A 100 meter guy wire is stretched taut from the top of the tower to an anchor on the ground. How far is the anchor from the base of the tower?

Solution. By the Pythagorean Theorem, the length we seek is

$$\sqrt{100^2 - 80^2} = \sqrt{3600} = 60.$$

3**. Find the distance between $(-1, -2)$ and $(3, -5)$.

Solution. We use the distance formulas with $(x_1, y_1) = (-1, -2)$ and $(x_2, y_2) = (3, -5)$,

$$\begin{aligned} d &= \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2} \\ &= \sqrt{(-1-3)^2 + (-2-(-5))^2} \\ &= \sqrt{(-4)^2 + (3)^2} \\ &= \sqrt{16+9} = 5. \end{aligned}$$

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4. Find the equation of the line which passes through $(1, -2)$ and which is parallel to the line $2x + y = 3$. Write your answer in slope-intercept form, and sketch its graph.

Solution. The line $2x + y = 3$ in slope-intercept form is $y = -2x + 3$, and thus it has slope -2. Thus the line we are seeking passes through $(1, -2)$ and has slope -2, and so it is

$$y - (-2) = -2(x - 1).$$

Simplifying and converting to slope-intercept form gives

$$y = -2x.$$

This is a line through the origin with slope -2. (I'll leave the graph to you.)

4*. Find the equation of the line which passes through $(0, 2)$ and which is perpendicular to the line $2y = 1 - x$. Write your answer in slope-intercept form, and sketch its graph.

Solution. The line $2y = 1 - x$ in slope-intercept form is $y = -\frac{1}{2}x + \frac{1}{2}$, and thus has slope $-\frac{1}{2}$. Any line perpendicular to it has slope equal to the negative reciprocal of $-\frac{1}{2}$, namely 2. So the line we seek has slope 2 and passes through $(0, 2)$. So it is given by

$$y - 2 = 2(x - 0),$$

or, in slope-intercept form,

$$y = 2x + 2.$$

Once again I'll leave the graph to you.

4**. Find the equation of the line which passes through $(2, -3)$ and which has the same slope as the line passing through $(2, 3)$ and $(4, -5)$. Write your answer in slope-intercept form, and sketch its graph.

Solution. The line through $(2, 3)$ and $(4, -5)$ has slope

$$\frac{-5-3}{4-2} = -4.$$

So the line we seek has slope -4 and passes through $(2, -3)$. Hence it is given by

$$y - (-3) = -4(x - 2).$$

In slope-intercept form this is

$$y = -4x + 5.$$

I'll leave the graph to you.

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5. Perform the indicated operations and simplify:

$$(x + 1)^2 - (x + 2)^2 + 3.$$

Solution. Remember $(x + 1)^2 \neq x^2 + 1$!! Instead we rewrite the original expression as

$$(x + 1)(x + 1) - (x + 2)(x + 2) + 3.$$

FOILing out gives

$$x^2 + 2x + 1 - (x^2 + 4x + 4) + 3,$$

and distributing the minus sign gives

$$x^2 + 2x + 1 - x^2 - 4x - 4 + 3.$$

Finally combining like terms gives

$$-2x.$$

The degree is 1 and the leading coefficient is -2.

5*. Perform the indicated operations and simplify:

$$(x - 1)(x^2 - 2x + 3) - (x + 2).$$

Solution. We distribute to get

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

or

$$x^3 - 2x^2 + 3x - x^2 + 2x - 3 - x - 2,$$

and combining like terms gives

$$x^3 - 3x^2 + 4x - 5.$$

The degree is 3 and the leading coefficient is 1.

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6. Perform the indicated operations and simplify:

$$\frac{x^2 - 4x - 5}{x^2 - 1} \cdot \frac{x^2 + 3x + 2}{x^2 + 10x + 25}.$$

Solution. We have

$$\frac{x^2 - 4x - 5}{x^2 - 1} \cdot \frac{x^2 + 3x + 2}{x^2 + 10x + 25}. = \frac{(x^2 - 4x - 5)(x^2 + 3x + 2)}{(x^2 - 1)(x^2 + 10x + 25)}.$$

To simplify we must factor as much as possible

$$\frac{(x-5)(x+1)(x+2)(x+1)}{(x+1)(x-1)(x+5)(x+5)}$$

and then cancel one of the $x + 1$ factors to get

$$\frac{(x-5)(x+2)(x+1)}{(x+5)(x+5)(x-1)};$$

note that we have masked a "bad point" and must stipulate $x \neq -1$.

6*, Perform the indicated operations and simplify:

$$\frac{x}{x-3} + \frac{1}{x-4} - \frac{x}{x+4}$$

Solution. We have to find a common denominator. The best we can do is $(x-3)(x-4)(x+4)$. So the original expression becomes

$$\frac{x}{x-3} \cdot \frac{(x-4)(x+4)}{(x-4)(x+4)} + \frac{1}{x-4} \cdot \frac{(x-3)(x+4)}{(x-3)(x+4)} - \frac{x}{x+4} \cdot \frac{(x-3)(x-4)}{(x-3)(x-4)}$$

or

$$\frac{x(x+4)(x-4)}{(x-3)(x-4)(x+4)} + \frac{(x-3)(x+4)}{(x-3)(x-4)(x+4)} - \frac{x(x-3)(x-4)}{(x-3)(x-4)(x+4)}.$$

We have a common denominator, so we can add the numerators to obtain

$$\frac{x(x+4)(x-4) + (x-3)(x+4) - x(x-3)(x-4)}{(x-3)(x-4)(x+4)}.$$

We can simplify the numerator by FOILing and further distributing to get

$$\frac{x(x^2 - 16) + x^2 + x - 12 - x(x^2 - 7x + 12)}{(x-3)(x-4)(x+4)}$$

or

$$\frac{x^3 - 16x + x^2 + x - 12 - x^3 + 7x^2 - 12x}{(x-3)(x-4)(x+4)}.$$

Combining like-terms in the numerator, we get

$$\frac{8x^2 - 27x - 12}{(x-3)(x-4)(x+4)}.$$

We could multiply the denominator, but we don't need to.

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7. Rewrite using rational exponents and simplify so that no fractional exponents or radicals appear in your final answer:

$$\frac{\sqrt[4]{16x^6}}{\sqrt{x^3}}.$$

Solution. We convert to obtain

$$\frac{(16x^6)^{1/4}}{(x^3)^{1/2}},$$

and use the rule of exponents to arrive at

$$\frac{16^{1/4}x^{6/4}}{x^{3/2}} = 2x^{6/4-3/2} = 2.$$

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8. Simplify so that no fractional exponents (or radicals) appear in your final answer:

$$\frac{x^{2/3}}{x^{-1/3}} \cdot (x^6)^{1/3}.$$

Solution. Use the rules of exponents to obtain

$$x^{2/3-(-1/3)}x^{6/3} = x^1x^2 = x^3.$$

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9. Solve by any method you choose:

$$x^2 + 11x + 28 = 0.$$

Solution. This one factors nicely as

$$(x+7)(x+4) = 0,$$

so either $x + 7 = 0$ or $x + 4 = 0$. Thus $x = -4$ or $x = -7$. (You could have used the quadratic formula or could have completed the square to obtain the same answer.)

9*. Solve by any method you choose:

$$x^2 + x - 7 = 0.$$

Solution. This one doesn't factor nicely. So (for instance) we can apply the quadratic formula with $a = 1$, $b = 1$, and $c = -7$ to get

$$x = \frac{-1 \pm \sqrt{1^2 - 4(1)(-7)}}{2(1)} = \frac{-1 \pm \sqrt{29}}{2}.$$

(You could also have completed the square to get the final answer.)

9**. Solve by any method you choose:

$$x^2 + 2x = 9.$$

Solution. One possibility it to complete the square by adding 1 to both sides to obtain

$$x^2 + 2x = 1 = 9 + 1,$$

or

$$(x+1)^2 = 10.$$

So

$$x + 1 = \sqrt{10} \qquad \text{or} \qquad x + 1 = -\sqrt{10}.$$

So

$$x = -1 \pm \sqrt{10},$$

which one could have also obtained by using the quadratic formula.

9***. Solve by any method you choose:

$$-x^2 + 2x = 2(x^2 - x) - 5.$$

Solution. Bring everything on one side to obtain

$$3x^2 - 4x - 5 = 0.$$

This one doesn't factor nicely, so we apply the quadratic formula with $a = 3$, $b = -4$, and $c = -5$ to get

$$x = \frac{-(-4) \pm \sqrt{(-4)^2 - 4(3)(-5)}}{2(3)} = \frac{4 \pm \sqrt{76}}{6}$$

which we could simplify as

$$x = \frac{4 \pm 2\sqrt{19}}{6} = \frac{2 \pm \sqrt{19}}{3}.$$

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10. Solve for x:

$$2 - \sqrt{x - 3} = 0.$$

Solution. Isolate the radical to obtain

$$\sqrt{x - 3} = 2.$$

Squaring both sides we get

$$x - 3 = 4,$$

and so $x = 7$. This solution checks out.

10*. Solve for x:

$$\sqrt{8 - 2x} = x.$$

Solution. Squaring both sides we obtain

$$8 - 2x = x^2.$$

Now we bring everything on one side to get

$$x^2 + 2x - 8 = 0.$$

This one factors as

$$(x + 4)(x - 2) = 0,$$

and so $x = -4$ or $x = 2$. Plugging back in (as we must with radical equations!), we see that $x = -4$ is not a valid solution. So $x = 2$ is the only solution.

10**. Solve for x:

$$\sqrt{x - 1} = 1 + \sqrt{x - 7}.$$

Solution. We cannot isolate both radical simultaneously, so we square the given equation (and FOIL the right side) to get

$$\begin{aligned}(\sqrt{x-1})^2 &= (1 + \sqrt{x-7})^2 \\ x - 1 &= 1 + \sqrt{x-7} + \sqrt{x-7} + (x - 7) \\ x - 1 &= 1 + 2\sqrt{x-7} + (x - 7).\end{aligned}$$

Now we can simplify and isolate the radical to obtain

$$5 = 2\sqrt{x - 7}.$$

Squaring both sides yields,

$$25 = 4(x - 7)$$

or

$$25 = 4x - 28,$$

which we quickly solve to get

$$x = 53/4.$$

This solution checks out.

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11. Eighty percent of a number equals half the number plus 10. What is the number?

Solution. Let x be the number we seek. The first sentence of the problem translates into

$$0.8x = 0.5x + 10.$$

So

$$0,3x = 10,$$

or

$$x = \frac{10}{0.3} = \frac{100}{3}.$$

11*. A small rectangular garden plot is 800 square feet in area. If the length of the plot is twice its width, what is the width of the plot?

Solution. Let w be the width. Then the length is $2w$ and so

$$w(2w) = 800.$$

Thus

$$2w^2 = 800,$$

or

$$w^2 = 400,$$

and $w = 20$.

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12. Solve the following system of equations by any method you wish:

$$\begin{aligned} x - 2y &= 13 \\ 2x - y &= 11. \end{aligned}$$

Solution. There are a number of ways to do this. The answer is $x = 3$ and $y = -5$.

12*. Solve the following system of equations by any method you wish:

$$\begin{aligned} x - 2y + 3z &= 22 \\ 5y + 3z &= 26. \\ 3y - 2z &= -11. \end{aligned}$$

Solution. This one is more complicated. But note that the last two equations are two equations in two unknowns. So, setting aside the first equation for a moment, we can solve the second and third (by any number of means) to get $y = 1$ and $z = 7$. Now plug those into the first to get

$$x - 2(1) + 3(7) = 22,$$

which we can quickly solve to get $x = 3$.

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13. Simplify as much as possible:

$$\sqrt[5]{64x^5y^6}.$$

Solution. By grouping in groups of five as much as possible, we obtain

$$2xy\sqrt[5]{2y}$$

as our answer.

13*. Simplify as much as possible:

$$\sqrt[3]{\frac{16z^3}{y^6}}.$$

Solution. We break the radical apart over the fraction to get

$$\frac{\sqrt[3]{16z^3}}{\sqrt[3]{y^6}}.$$

By grouping in groups of three as much as possible, we obtain

$$\frac{2z\sqrt[3]{2}}{y^2}.$$

13**. Simplify as much as possible:

$$\sqrt{4e^{6x}y^3}.$$

Solution. By grouping in groups of two as much as possible, we obtain

$$\begin{aligned}\sqrt{4e^{6x}y^3} &= \sqrt{2^2(e^{3x})^2y^2y}\\ &= 2e^{3x}y\sqrt{y}.\end{aligned}$$

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14. Solve for x:

$$\frac{500}{3x+5} = \frac{50}{x-3}.$$

Solution. Multiplying both sides by $(x-3)(3x+5)$ to clear denominators (or "cross multiplying") gives

$$500(x-3) = 50(3x+5)$$

or

$$350x = 1750.$$

So

$$x = \frac{1750}{350} = \frac{175}{35} = 5.$$

14*. Solve for x:

$$x - \frac{24}{x} = 5.$$

Solution. Clear denominators by multiplying through by x to obtain

$$x^2 - 24 = 5x.$$

Bringing everything on one side of the equation gives

$$x^2 - 5x - 24 = 0.$$

This one factors as

$$(x-8)(x+3) = 0,$$

and so $x = 8$ or $x = -3$.

14**. Find all solutions of:

$$\frac{1}{y+2} - \frac{1}{y+4} = \frac{2}{15}$$

Solution. We need to clear the denominators by multiplying both sides by $15(y+2)(y+4)$. We get

$$15(y+2)(y+4)\left(\frac{1}{y+2} - \frac{1}{y+4}\right) = 15(y+2)(y+4)\left(\frac{2}{15}\right).$$

Distributing, we get

$$15(y+4) - 15(y+2) = 2(y+2)(y+4).$$

Distributing further, we get

$$15y + 60 - 15y - 30 = 2(y^2 + 6y + 8)$$

or

$$30 = 2y^2 + 12y + 16.$$

Bringing everything to the right side gives

$$0 = 2y^2 + 12y - 14.$$

We can divide both sides by 2 to get

$$0 = y^2 + 6y - 7.$$

This factors as

$$0 = (y+7)(y-1).$$

So we conclude $y = -7$ or $y = 1$. Both solutions check out.

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15. Find the domain of

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

Solution. Remember that the domain consists of all numbers which can by inputed to f. We get into trouble if we divide by zero. The only way that can happen is if $x = 2$ or $x = -3$. Thus the domain consists of all real numbers except for $x = 2$ and $x = -3$.

15*. Find the domain of

$$f(x) = \frac{1}{x^2 - 8x + 15}$$

Solution. Again we get into trouble only when the denominator is zero,

$$x^2 - 8x + 15 = 0.$$

This factors as $(x-5)(x-3) = 0$. So we get into trouble when $x = 3$ or 5. Thus the domain of f consists of all real numbers except $x = 3$ and $x = 5$.

15**. Find the domain of

$$f(x) = \log_{10}(5x - 7).$$

Solution. Remember that $\log_a$ of a negative number (or zero) does not make sense. So we get into trouble when

$$5x - 7 \leq 0,$$

that is when

$$x \leq \frac{7}{5}.$$

These are the places we get into trouble. Thus the domain consists of all x for which $x > \frac{7}{5}$.

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16. You and your neighbor can build a 20 foot section of fence in 6 hours. Working on your own, it would take you 14 hours. How long would it take your neighbor if he were to work on his own?

Solution. Let x be the number of hours it would take your neighbor to build the fence. The information in the problem tells you:

Your work rate: 1 fence/14 hours

Your neighbor's work rate: 1 fence/x hours.

The final piece of information is that you can build one fence in 6 hours working together:

$$1 \text{ fence } = 6 \text{ hours}\,(1 \text{ fence}/14 \text{ hours} + 1 \text{ fence}/x \text{ hours})$$

or

$$1 = 6\left(\frac{1}{14} + \frac{1}{x}\right).$$

Distributing the 6 through gives

$$1 = \frac{6}{14} + \frac{6}{x}.$$

Multiplying both sides by $14x$ to clear denominators, we get

$$14x = 14x\left(\frac{6}{14} + \frac{6}{x}\right)$$

or

$$14x = 6x + 84.$$

We quickly solve for x to get

$$x = 84/8 = 10.5.$$

So it would take your neighbor 10.5 hours to complete the fence on his own.

16*. There are two kinds of tickets sold to the Ballet West production of the Nutcracker. Adult tickets cost \$21 and kids tickets cost \$8. If there are twice as many children in the sold out 2400-seat theatre, how much money did the box office collect?

Solution. Let x be the number of adult tickets and y be the number of kids tickets. We seek the total sales figure, namely

$$\text{total sales } = 21x + 8y.$$

We also know there are the number of kids tickets is twice the number of adult tickets,

$$y = 2x.$$

Finally we know the number of tickets sold (kids and adults) is 2400,

$$x + y = 2400.$$

Substituting $y = 2x$, we get

$$x + 2x = 2400,$$

and so $3x = 2400$ and $x = 800$. Thus $y = 2(800) = 1600$. So the total sales are

$$\text{total sales } = 21(800) + 8(1600) = 16800 + 12800 = 29600.$$

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17. If $f(x) = x^2 + 2x + 1$ and $g(x) = x - 1$, compute $(f \circ g)(x)$.

Solution. We have

$$\begin{aligned}
(f \circ g)(x) &= f(g(x)) \\
&= f(x-1) \\
&= (x-1)^2 + 2(x-1) + 1 \\
&= x^2 - 2x + 1 + 2x - 2 + 1 \\
&= x^2.
\end{aligned}$$

17*. If $f(x) = \log_3(3x - 1)$ and $g(x) = 3^x + \frac{1}{3}$, compute $(f \circ g)(x)$.

Solution. We have

$$\begin{aligned}
(f \circ g)(x) &= f(3^x + \frac{1}{3}) \\
&= \log_3(3(3^x + \frac{1}{3}) - 1) \\
&= \log_3(3^{x+1} + 1 - 1) \\
&= \log_3(3^{x+1}) \\
&= x + 1.
\end{aligned}$$

17**. If $f(x) = x^2 + 2$ compute $(f \circ f)(x)$.

Solution. We have

$$\begin{aligned}(f \circ f)(x) &= f(f(x)) \\ &= f(x^2 + 2) \\ &= (x^2 + 2)^2 + 2 \\ &= x^4 + 4x^2 + 4 + 2 \\ &= x^4 + 4x^2 + 6.\end{aligned}$$

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18. Given that $\log_a(x) = 0.5$ and $\log_a(y) = 0.25$, compute $\log_a(x^2y^3)$.

Solution. Using the rules of logs, we have

$$\begin{aligned}\log_a(x^2y^3) &= \log_a(x^2) + \log_a(y^3) \\ &= 2\log_a(x) + 3\log_a(y) \\ &= 2(0.5) + 3(0.25) \\ &= 1 + 0.75 = 1.75.\end{aligned}$$

18*. Using the property of logs, simplify $\log_5(50) - \log_5(10)$.

Solution. We have

$$\log_5(50) - \log_5(10) = \log_5\left(\frac{50}{10}\right) = \log_5(5) = 1.$$

18**. Using properties of logs, condense the following expression: $\log_3(2) + \frac{1}{2}\log_3(y)$.

Solution. We have

$$\begin{aligned}\log_3(2) + \frac{1}{2}\log_3(y) &= \log_3(2) + \log_3(y^{1/2}) \\ &= \log_3(2y^{1/2}) \\ &= \log_3(2\sqrt{y}).\end{aligned}$$

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19. Sketch the graph of $f(x) = 2^x + 3$. Clearly label any x- and y-intecepts.

Solution. The graph in question is the graph of 2^x (which we gave in class) shifted up 3 units. Thus our graph blows up in the positive direction, and (in the negative direction) has a horizontal asymptote at $y = 3$. It doesn't cross the x-axis, so there are no x-intercepts. To find the y intercept, we plus in $x = 0$ to get $2^0 + 3 = 1 + 3 = 4$. I'll leave the sketching to you.

19*. Sketch the graph of $g(x) = x^2 - 3x - 4$. Clearly label any x- and y-intercepts.

Solution. This is a parabola which opens upward. The x coordinate of its vertex is

$$x = -b/2a = -(-3)/2(1) = 3/2.$$

We plug in to find the y coordinate,

$$y = (3/2)^2 - 3(3/2) - 4 = 9/4 - 9/2 + 4 = 9/4 - 18/4 - 16/4 = -25/4.$$

So the vertex is at $(3/2, -25/4)$. The y-intercept is obtained by plugging in $x = 0$, so it is at -4. Finally, to find the x-intercepts, we have to set $y = 0$ and solve

$$x^2 - 3x - 4 = 0.$$

This one factors as $(x - 4)(x + 1) = 0$. So the x-intercepts are at $x = 4$ or $x = -1$. I'll leave the sketching to you.

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20. A \$1000 investment is made is a trust fund with an annual interest rate of 10% compounded continuously. After t years, the value of the fund is

$$P(t) = 1000e^{t/10}$$

How long will it take the investment to double in value? You may leave logarithms and exponentials in your answer.

Solution. We want to the find the time it takes for the investment to double to 2000. So we want to solve for t in

$$2000 = 1000e^{t/10}.$$

Dividing by 1000, we get

$$2 = e^{t/10}.$$

By definition, we have

$$t/10 = \ln(2)$$

or

$$t = 10\ln(2),$$

about 6.9 years.

20*. A radioactive element has a half life of 1000 years. Fifty pounds of the element were buried in the West Desert in 2010. How much of the substance will remain in the year 5010?

Solution. In 3010 (after 1000 years), the mass of the substance will have halved to 25 pounds. In 4010 (after another 1000 years) it will have halved again to $25/2 = 12.5$ pounds. Finally, in 5010 it will have halved again to $12.5/2 = 6.25$ pounds. This is our final answer. Alternatively, you could have used the half-life formula to conclude the mass would be

$$50\left(\frac{1}{2}\right)^{3000/1000} = 50\left(\frac{1}{2}\right)^{3} = 50\left(\frac{1}{8}\right) = \frac{50}{8} = 6.25.$$