1. Graph the line.

\[ y = -\frac{1}{4}x + 5 \]

Then, vertex is \( x = \frac{1}{2} \), \( y = \frac{1}{2} \).

\[ y \text{ intercept} \]

\( y = -\frac{1}{4}x + 5 \)

\( (0, 5) \)

\( y = -\frac{1}{4}(4) + 5 = 4 \)

\( (4, 4) \)

2. Find the slope and the \( y \)-intercept of the line.

\[ 7x - 2y = -2 \]

Write your answers in simplest form.

\[ 7x - 2y = -2 \]

\[ -2y = -7x - 2 \]

\[ y = \frac{7}{2}x + 1 \]
3. Consider the line \( y = \frac{3}{4} x + 7 \)
\[ \begin{align*}
\text{Parallel line: } y & = \frac{3}{4} x + b \\
5 & = \frac{3}{4}(-8) + b \\
b & = \frac{32}{3} + b \\
& - \frac{17}{3}
\end{align*} \]

(a) Find the equation of the line that is parallel to this line and passes through the point \((-8, 5)\)

(b) Find the equation of the line that is perpendicular to this line and passes through the point \((-8, 5)\)

For perpendicular:
\[ y = -\frac{4}{3} x + b \]
\[ \frac{15}{3} = \frac{-32}{3} + b \]
\[ b = \frac{-17}{3} \]

4. Consider the line \( y = \frac{5}{3} x + 5 \)

(a) Find the equation of the line that is perpendicular to this line and passes through the point \((-5, -4)\)

(b) Find the equation of the line that is parallel to this line and passes through the point \((-5, -4)\)

5. A motorboat takes 3 hours to travel 144 km going upstream. The return trip takes 2 hours going downstream. What is the rate of the boat in still water and what is the rate of the current?

Use:

\[ \begin{align*}
\text{Rate of the boat in still water: } & D \text{ km/h } \\
\text{Rate of the current: } & C \text{ km/h }
\end{align*} \]

Formula:
\[ \frac{144}{3} = x - y \text{ upstream} \]
\[ \frac{144}{2} = x + y \text{ downstream} \]

Solving:
\[ \begin{align*}
144 & = 3(x - y) \\
144 & = 2(x + y)
\end{align*} \]

6. Jose bought a desktop computer and a laptop computer. Before finance charges, the laptop cost \$450 less than the desktop. He paid for the computers using two different financing plans. For the desktop the interest rate was 6.5% per year, and for the laptop it was 9% per year. The total finance charges for one year were \$409. How much did each computer cost before finance charges?

Let:
\[ \begin{align*}
D & = \text{ desktop cost} \\
L & = \text{ laptop cost}
\end{align*} \]

\[ \begin{align*}
.065 D + .09 L & = 409 \\
.065 D + .09 (D - 450) & = 409 \\
.065 D + .09 D - 40.5 & = 409
\end{align*} \]

Solving:
\[ \begin{align*}
D & = 2900 \\
L & = 2450
\end{align*} \]
8. Simplify.
\[
(-2a^4b^{-6})^2 = \left(\frac{-2a^4}{b^6}\right)^2 = \frac{(-2)^2(a^4)^2}{(b^6)^2} = \frac{4a^8}{b^{12}}
\]
Write your answer using only positive exponents.

9. Write \(0.0000973\) in scientific notation.

\[
9.73 \times 10^{-4}
\]
Count decimal places to first spot behind a nonzero number. If you go to the right it will be negative, so left will be positive.

10. Multiply.
\[(y+1)(y-6)\]
Foil\[y^2+6y-7y-6 = y^2-7y-6\]
Simplify your answer.

11. Divide.
\[
\left(\frac{-15 \sqrt[4]{x^2} + 4\sqrt[3]{x^3}}{2 \sqrt[4]{x^2}}\right)
\]
Rewrite,\[\frac{-15 \sqrt[4]{x^2}}{2 \sqrt[4]{x^2}} + \frac{4\sqrt[3]{x^3}}{2 \sqrt[4]{x^2}}\]
Simplify your answer as much as possible.

12. Divide.
\[
(11x - 6x^3 + 3 - 15x^4 - 4x^2) \div (-3x^2 + 1)
\]
Write your answer in the following form: Quotient + \[
\frac{-3x^2 + 1}{-3x^2 + 1}
\]
\[
\frac{5x^2 + 2x + 3}{-15x^4 - 6x^3 - 4x^2 + 11x + 3}
\]
\[
-\frac{-15x^4}{-6x^3 - 9x^2 + 11x + 3} - \frac{9x}{-9x^2 + 9x + 3}
\]
\[
\frac{-15x^4}{-6x^3 - 9x^2 + 11x + 3} - \frac{9x}{-9x^2 + 9x + 3}
\]
13. Factor $9y^2 - 15y^3 = 3y^2(3-5y)$

14. Factor by grouping.

\[
\begin{align*}
ur - 14 &= u + 7u^2 - 2y \\
&= (7u^2 - 14u + u + 2y) \\
&= (7u + y)(u - 2)
\end{align*}
\]

15. Solve for $x$ in the equation below.
Round your answer to the nearest hundredth.
Do not round any intermediate computations.

\[
\begin{align*}
12^{x+9} &= 7 \\
\log_{12} 12^{x+9} &= \log_{12} 7 \\
(x+9) \log_{12} 12 &= \log_{12} 7 \\
x + 9 &= \frac{\log_{12} 7}{\log_{12} 12} \\
x &= \frac{\log_{12} 7}{1} - 9 \\
x &= \log_{12} 7 - 9
\end{align*}
\]

\[
x = -8.22
\]

16. Solve for $x$

\[
\begin{align*}
2^{x^2+18x-18} &= 32^{3x-4} \\
\left(2^{5}\right)^{x^2+18x-18} &= (2^5)^{3x-4} \\
x^2 + 18x - 18 &= 5(3x - 4) \\
x^2 + 18x - 18 &= 15x - 20 \\
x^2 - 3x - 2 &= 0 \\
x &= -1 \text{ or } 2
\end{align*}
\]

17. Fill in the missing values to make the equations true.

(a) $\log_2 5 + \log_2 7 = \log_2 35$

(b) $\log_7 3 - \log_7 11 = \frac{3}{11}$

(c) $\log_5 81 = 4 \log_5 3$

\[
81 = 3^4
\]
18. Consider the equation
\[(x+3) \log_q 14 = 3\]
\[\log_q 14^{x+3} = 3\]
Find the value of \(x\) Round your answer to 3 decimal places.

\[x + 3 = \frac{3}{\log_q 14} - 3\]
\[x = \frac{3}{\log_q 14} - 3\]
\[x = -1.424\]

19. Evaluate.
\[\log_3 81 = x\]
Rewrite as
\[3^x = 81 = 3^4\]
\[x = 4\]

20. Solve for \(x\)
\[8^{x^2} = x\]
\[\log_8 x = -2\]
Simplify your answer as much as possible.
\[x = \frac{1}{64}\]
21. Graph the parabola \( y = (x - 1)^2 - 3 \). What ever makes the parenthesis = 0 is your vertex. So \( x = 1 \) is vertex.

<table>
<thead>
<tr>
<th>( x )</th>
<th>((-1-1)^2-3 = 4-3)</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>((-1)^2-3 = 1^2-3)</td>
<td>-2</td>
</tr>
<tr>
<td>1</td>
<td>((1-1)^2-3 = 0-3)</td>
<td>-3</td>
</tr>
<tr>
<td>2</td>
<td>((2-1)^2-3 = 1^2-3)</td>
<td>-2</td>
</tr>
<tr>
<td>3</td>
<td>((3-1)^2-3 = 2^2-3)</td>
<td>1</td>
</tr>
</tbody>
</table>

22. Solve \((y+6)^2 - 72 = 0\) where \( y \) is a real number.
Simplify your answer as much as possible.

\[ \text{Foil:} \quad (y+6)(y+6) - 72 \quad A = 1; \quad B = 12; \quad C = -36 \]
\[ y^2 + 12y + 36 - 72 = y^2 + 12y - 36 = 0 \]

23. Rationalize the denominator and simplify.

\[ \frac{\sqrt{11} - \sqrt{3}}{\sqrt{11} + \sqrt{3}} = \frac{11 - 2\sqrt{33} + 3}{11 - 3} \]
\[ \frac{14 - 2\sqrt{33}}{8} = \frac{7 - \sqrt{33}}{4} \]

24. Solve for \( u \) where \( u \) is a real number.

\[ (\sqrt{40 - 6u})^2 = (u - 4)^2 \quad \text{Foil:} \quad u = 6, -4 \]
\[ 40 - 6u = (u - 4)(u - 4) \quad \text{Plus back in} \]
\[ 40 - 6u = u^2 - 8u + 16 \]
\[ 40 - 6u = u^2 - 8u + 16 \]
\[ u^2 - 2u - 24 \]
\[ (u - 6)(u + 4) \]

\[ \sqrt{40 - 6u} = 2 \]
\[ 40 - 6u = 4 \]
\[ -6u = -36 \]
\[ u = 6 \]

Not true b/c there is not a negative in front of the radical.

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25. For the following right triangle, find the side length $x$. Round your answer to the nearest hundredth.

Pythagorean's Thm: $c = \sqrt{a^2 + b^2}$

\[ 18 = \sqrt{x^2 + 11^2} \]
\[ 18^2 = x^2 + 121 \]
\[ 324 = x^2 + 121 \]
\[ 324 - 121 = x^2 \]
\[ x = \sqrt{203} \]
\[ x = 14.25 \]

26. Write the following expression in simplified radical form.

\[ \sqrt{32x^8w/12} \]
\[ = \sqrt{32 \cdot x^8 \cdot w/12} \]
\[ = \sqrt{2^5 \cdot x^8 \cdot w/2^2} \]
\[ = \sqrt{2^3 \cdot x^8 \cdot w} \]
\[ = 2x^4 \sqrt{2 \cdot w} \]

Assume that all of the variables in the expression represent positive real numbers.

27. How many machines will be needed to complete a task in 9 days, given that 6 machines can complete the same task in 6 days?

Time * Machines = Work

\[ T_1 = 6 \text{ days} \]
\[ M_1 = 6 \text{ machines} \]
\[ W = (6 \cdot 6 = 36 = 6) \]

Since work is the same in both cases, we can use it for our next equation.

\[ T_2 = 9 \text{ days} \]
\[ M_2 = x \text{ machines} \]
\[ W = 36 \]
\[ 9x = 36 \]
\[ x = 4 \text{ machines} \]