(4) 1. Simplify. Give answers with no negative exponents.

(a) $\left(\dfrac{3a^{-2}b^3}{2a^5b^{-1}}\right)^{-3}$ (b) $\left(\dfrac{a^{12}b^8}{25c^6}\right)^{\frac{1}{2}}$

(2) 2. Rationalize the numerator of $\dfrac{\sqrt{3}-\sqrt{5}}{7}$.

(6) 3. Perform the indicated operations and simplifiy as much as possible.

(a) $\dfrac{x}{x^2-9}-\dfrac{3}{x+3}$ (b) $2(3x+5)-3(x-2)^2$

(4) 4. Factor completely.

(a) $2a^2+7a-4$ (b) x^4-y^4 (c) $2a^3-16$

(6) 5. Solve the following.

(a) $\dfrac{x+2}{3}=\dfrac{2x-1}{5}$ (b) $9x^2+3x=7$ (c) $\sqrt{5x-1}-7=0$

(6) 6. For the points $P(-2,1)$ and $Q(4,3)$:

(a) find the slope of the segment $\overline{PQ}$;

(b) find the coordinates of the midpoint M of $\overline{PQ}$;

(c) find the length of the segment $\overline{PM}$.

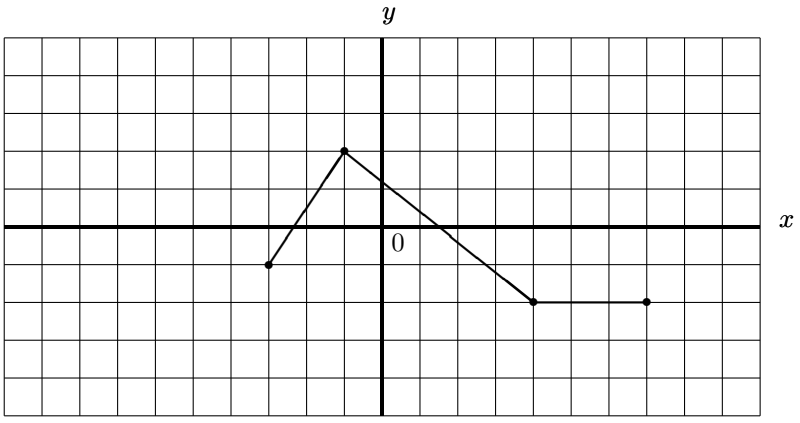
(2) 7. Find the equation of the line through $R(3,-5)$ that is perpendicular to the line $y=3x+7$.

(4) 8. (a) Given the function $f(x)=\begin{cases}1+x & \text{if } x\le -1,\\ x^2-1 & \text{if } x>1,\end{cases}$ evaluate (i) $f(-3)$, (ii) $f(1)$.

(b) Give the domain of (i) $f(x)=\sqrt{x+3}$, (ii) $y=\dfrac{2}{x+5}$.

(6) 9. Sketch the graph of the function $f(x)=\dfrac{3-2x}{2-x}$. Find the (a) domain, (b) horizontal asymptote, (c) vertical asymptote, (d) x-intercept, (e) y-intercept.

(6) 10. Given the graph of $f(x)$ as shown:



(a) Determine the intervals over which the function is: (i) increasing, (ii) decreasing.

(b) Find: (i) the domain of $f(x)$, (ii) the range of $f(x)$.

(c) Use the graph to sketch the graph of $y=f(x+2)-1$

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(6) 11. Sketch the following graphs and give the domain and range.

(a) $y = 2^x + 1$ (b) $y = x^2 - 2x - 2 = (x-1)^2 - 3$

(6) 12. (a) Write the expression $2\log_2(x-1) - 3\log_2(x+2) + \dfrac{1}{2}\log_2 x$ as the logarithm of a single quantity.

(b) Use your calculator to evaluate $\log_{15} 3400$.

(8) 13. Solve each of the following equations. Give the answers to 2 decimal places.

(a) $e^x = 50$ (b) $3^x = \dfrac{1}{81}$ (c) $2^{x-2} = 15$

(d) $\log_5(2x-1) - \log_5(x+1) = \log_5(7-x) - \log_5(2x+1)$

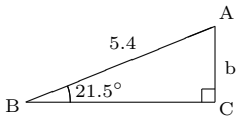
(8) 14. (a) Convert $330°$ to radian measure. Give your answer to one decimal place.

(b) If $\theta = -\frac{5\pi}{4}$ is in standard position, state the quadrant in which the terminal side of θ lies.

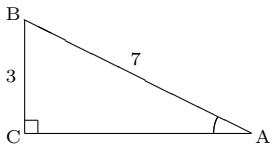
(c) If $\sec\theta = -3$ and $\csc\theta > 0$, find the value of $\tan\theta$.

(d) If $\sin\theta = 0.7321$ and $90° < \theta < 180°$, find θ.

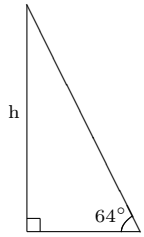
(6) 15. (a) Find the side b of the right triangle:



(b) Find the angle A of the right triangle:



(4) 16. Redwood trees are among the tallest of all trees. From a point 38 meters from the base of a redwood, the angle of elevation to the top of the tree is $64°$. Find the height of the tree to the nearest meter.

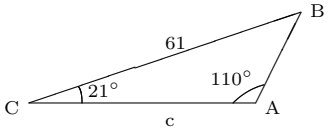


(4) 17. Sketch one complete cycle of the graph of $y = -2\cos 2\pi x$. State the period, amplitude and identify any intercepts.

(6) 18. Verify the following identities.

(a) $\dfrac{\sin\theta}{\csc\theta} = 1 - \cos^2\theta$ (b) $\sin t \sec t \tan t = \sec^2 t - 1$

(6) 19. (a) Find the side c of the triangle:



(b) Find the angle B (accurate to one decimal place) of the triangle: