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EXAM REVIEW UNITS 1 & 2**UNIT 1**

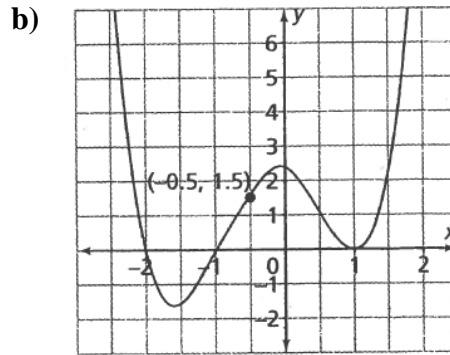
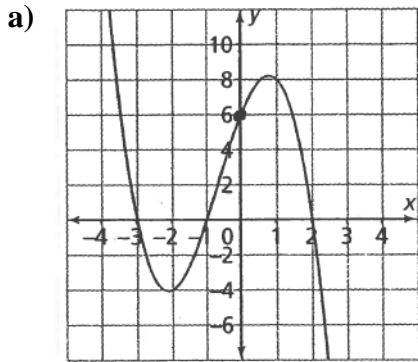
- When a polynomial $f(x)$ is divided by $2x-1$ the quotient is x^2-2x-1 and the remainder is -4 . Find $f(x)$ in expanded form.
- Find an exact value for the remainder when $-6x^3-2x^2+x+1$ is divided by $3x+1$ without using long division.
- The polynomial px^3-x^2+qx-2 has no remainder when divided by $x-1$ and a remainder of -18 when divided by $x+2$. Determine the values of p and q .
- If $-\frac{2}{3}$ is one root of $9x^3-3x^2+kx-6=0$, find k .
- Determine the quartic equation in expanded form with roots $0, 0, 1-3i\sqrt{2}$ and $1+3i\sqrt{2}$.
- Factor completely.
 - x^6-64
 - $2x^3-3x^2-5x+6$
 - $16x^4-24x^3+2x-3$
- Solve, $x \in C$.
 - $\frac{3x+1}{x}-\frac{x}{6}=2$
 - $x^3-x^2+9x-9=0$
 - $x^3-5x+2=0$
 - $4x^4+31x^2-8=0$
 - $\left(x+\frac{2}{x}\right)^2+2\left(x+\frac{2}{x}\right)-3=0$
- Solve each of the following. (Check for *extraneous* roots)
 - $\sqrt{3x+1}-\sqrt{x+1}=2$
 - $\sqrt{3x-2}-2\sqrt{x}-1=0$
- State the *solution set* for each of the following. (Use cases to solve **b** and **c**)
 - $|7-x|=11$
 - $|x-1|<x$
 - $|2x+4|\geq 12x$

Answers

- $f(x)=2x^3-5x^2-3$
- $\frac{2}{3}$
- $p=1, q=2$
- $k=-15$
- $x^4-2x^3+19x^2=0$
- $(x-2)(x^2+2x+4)(x+2)(x^2-2x+4)$
 - $(x-2)(2x+3)(x-1)$
 - $(2x-3)(2x+1)(4x^2-2x+1)$
- $3-\sqrt{15}, 3+\sqrt{15}$
 - $1, -3i, 3i$
 - $-1-\sqrt{2}, -1+\sqrt{2}, 2$
 - $-\frac{1}{2}, \frac{1}{2}, -2i\sqrt{2}, 2i\sqrt{2}$
 - $-2, -1, \frac{1+i\sqrt{7}}{2}, \frac{1-i\sqrt{7}}{2}$
- $x=8$
 - no solution
 - $\{-4, 18\}$
 - $\left\{x \in R \mid x > \frac{1}{2}\right\}$
 - $\left\{x \in R \mid x \leq \frac{2}{5}\right\}$

UNIT 2

1. Determine an *exact* equation of each function graphed below in *factored* form.



2. Sketch the following functions, clearly labeling all x -intercepts and identifying these intercepts as single, double or triple roots.

- a) $f(x) = (x+1)(2-x)(x-4)$ b) $f(x) = x^2(x-3)^3$ c) $f(x) = (1-x)(x+2)(x+1)^3$
 d) $f(x) = -x^4 - x^3 + 6x^2$ e) $f(x) = -x^4 + 5x^2 - 4$

3. Solve the following inequalities *graphically* where $x \in \mathbb{R}$. Answer using a *solution set*.

- a) $x^3 - 3x^2 - 9x + 27 \leq 0$ b) $x^3 - x^2 - 9x + 9 > 0$

4. Solve the following inequalities using a *number line strategy* where $x \in \mathbb{R}$. State your final answer using *interval notation*.

- a) $(2-x)^3(x+2)^2(1-3x) \geq 0$ b) $2x^3 - x^2 < 13x + 6$ c) $\frac{6x^2 - 5x + 1}{2x + 1} > 0$ d) $\frac{x-4}{x+1} \leq \frac{3x-8}{2x-1}$

5. Graph the following rational functions by finding and labeling any holes, intercepts, asymptotes and points where the function crosses the horizontal or linear oblique asymptotes. Include a table of values for a more accurate graph.

- a) $g(x) = \frac{6}{x^2 + 2x - 3}$ b) $f(x) = \frac{-x^2}{x-2}$ c) $f(x) = \frac{2x^3 - 8x}{x^3 + 2x^2 + x + 2}$

6. Solve the following inequalities *graphically*. State your final answer in a *solution set*.

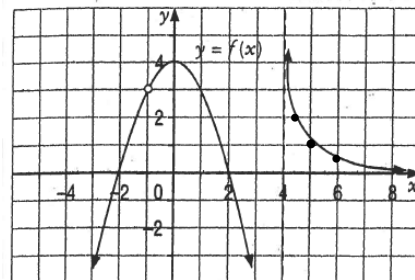
- a) $\frac{2x-1}{x+2} \leq 3$ b) $\frac{x^2 - x - 2}{x-1} > 0$

7. The graph of a piecewise function f is shown. Use the graph to determine the following:

a) $f(1) = \underline{\hspace{2cm}}$

b) $f(-1) = \underline{\hspace{2cm}}$

c) the equation of this piecewise function



d) the value(s) of x at which the function is discontinuous are $\underline{\hspace{2cm}}$

e) as $x \rightarrow -1^-$, $f(x) \rightarrow \underline{\hspace{1cm}}$ and as $x \rightarrow 4^+$, $f(x) \rightarrow \underline{\hspace{1cm}}$

f) the end behavior of f : as $x \rightarrow -\infty$, $f(x) \rightarrow \underline{\hspace{1cm}}$ and as $x \rightarrow +\infty$, $f(x) \rightarrow \underline{\hspace{1cm}}$

8. Graph the piecewise function $f(x) = \begin{cases} x+5 & \text{if } x < -3 \\ (x+1)^2 & \text{if } x \geq -3 \end{cases}$ and determine the value(s) of x at which the function is discontinuous.

9. Rewrite the function $f(x) = \frac{x^2 - 1}{|x - 1|}$ as a piecewise function.

10. Find constants a and b such that the function $f(x) = \begin{cases} ax - b & \text{if } x \in (-\infty, 1] \\ x - 2 & \text{if } x \in (1, 2) \\ 3x & \text{if } x \in (2, \infty) \end{cases}$

is continuous for all $x \in R$.

11. Given $f(x) = -\left|\frac{1}{2}x + 1\right| + 2$,

a) graph the function $y = f(x)$ by naming and applying transformations on an appropriate function.

b) sketch the graph of its reciprocal function $y = \frac{1}{f(x)}$ on the same grid.

12. Given $f(x) = 2\sqrt{x-1} - 4$,

a) graph the function $y = f(x)$ by naming and applying transformations on an appropriate function.

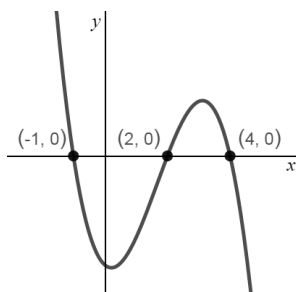
b) sketch the graph of its absolute value function $y = |f(x)|$ on the same grid.

Answers

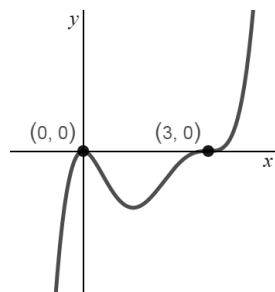
1. a) $f(x) = -(x+3)(x+1)(x-2)$

b) $f(x) = \frac{8}{9}(x+2)(x+1)(x-1)^2$

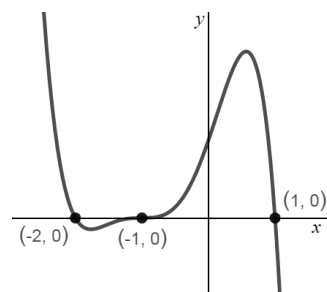
2. a)



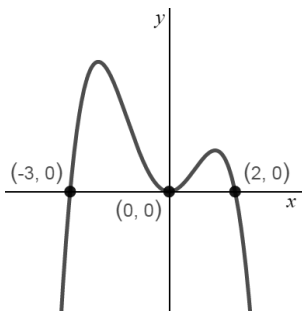
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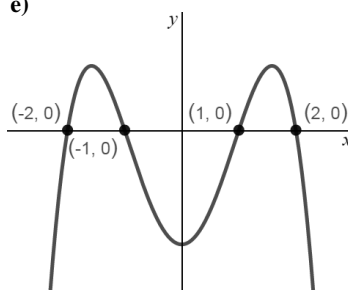
c)



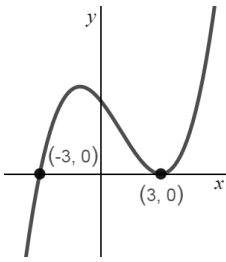
d)



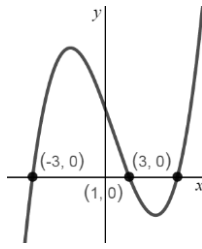
e)



3. a) $\{x \in \mathbb{R} \mid x \leq -3 \text{ or } x = 3\}$



b) $\{x \in \mathbb{R} \mid -3 < x < 1 \text{ or } x > 3\}$



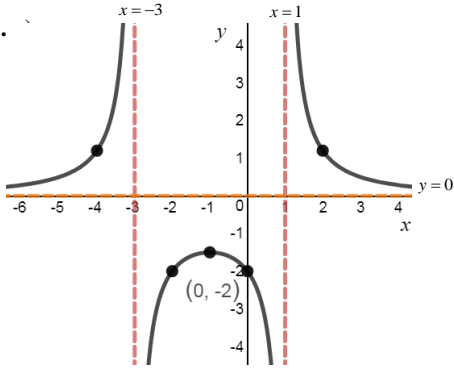
4. a) $x \in \left(-\infty, \frac{1}{3}\right] \cup [2, +\infty)$

b) $x \in (-\infty, -2) \cup \left(-\frac{1}{2}, 3\right)$

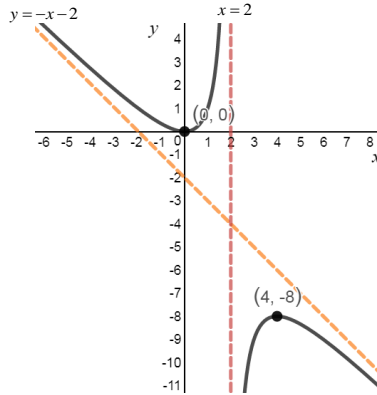
c) $x \in \left(-\frac{1}{2}, \frac{1}{3}\right) \cup \left(\frac{1}{2}, +\infty\right)$

d) $x \in (-\infty, -6] \cup \left(-1, \frac{1}{2}\right) \cup [2, +\infty)$

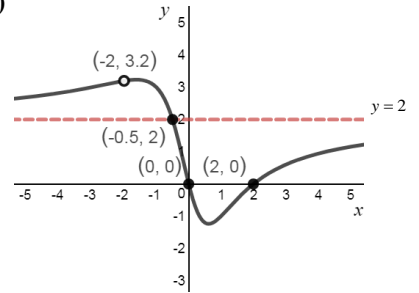
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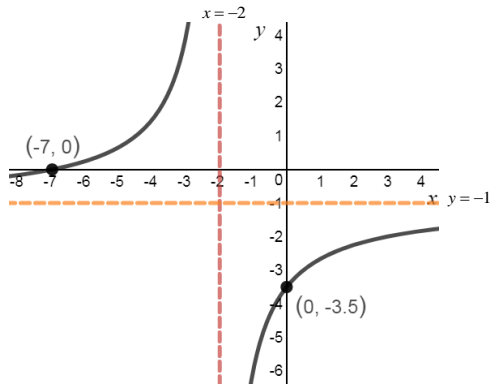
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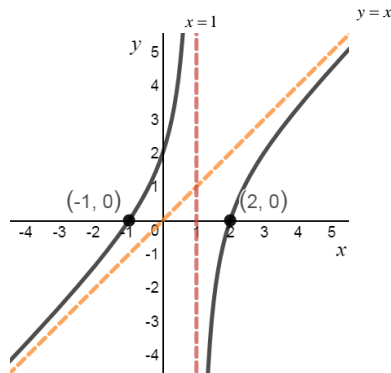
c)



6. a) $\{x \in \mathbb{R} \mid x \leq -7 \text{ or } x > -2\}$

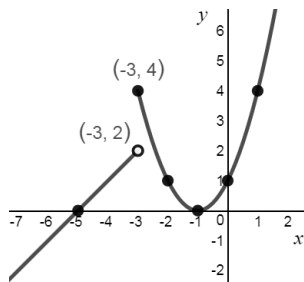


b) $\{x \in \mathbb{R} \mid -1 < x < 1 \text{ or } x > 2\}$

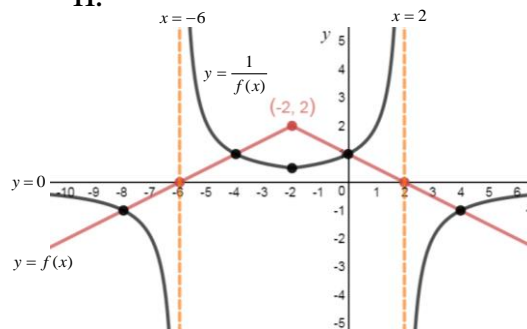


7. a) 3 b) dne c) $f(x) = \begin{cases} -x^3 - x^2 + 4x + 4, & \text{if } x < 4 \\ \frac{1}{x-4}, & \text{if } x > 4 \end{cases}$ d) $x = -1, x = 4$ e) $3, +\infty$ f) $-\infty, 0$

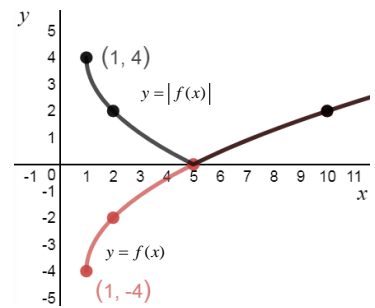
8. a) $x = -3$



11.



12.



9. $f(x) = \begin{cases} -x-1, & \text{if } x < 1 \\ +x+1, & \text{if } x > 1 \end{cases}$

10. $a = -2, b = 1$

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EXAM REVIEW UNITS 3 & 4

- Write out the *addition*, *subtraction*, and *double-angle formulas* for *sine*, *cosine*, and *tangent*.
- Graph $y = \sin \theta$ and its *reciprocal* function on the same grid for $-2\pi \leq \theta \leq 2\pi$.
 - Graph $y = \cos \theta$ and its *reciprocal* function on the same grid for $-2\pi \leq \theta \leq 2\pi$.
 - Graph **i)** $y = \tan \theta$ and **ii)** its *reciprocal* function on separate grids for $-2\pi \leq \theta \leq 2\pi$.
- Convert the following.
 - 195° to exact radians in terms of π
 - 6.85 radians to the nearest degree
- Determine the exact measure of each of the following.
 - a positive angle co-terminal with $\frac{\pi}{3}$
 - a negative angle co-terminal with 228°
 - the principal angle, if -520° is the angle in standard position
 - the principal angle, if the terminal arm lies in the third quadrant and the related acute angle is $\frac{\pi}{6}$
- Calculate exact values for each of the following. (Include a well-labeled diagram for each.)
 - $\sin \frac{3\pi}{2}$
 - $\sec \frac{-5\pi}{4}$
 - $\cot(-2\pi)$
 - $\tan \frac{8\pi}{3}$
 - $\csc\left(\frac{7\pi}{2}\right)$
 - $\cot\left(-\frac{7\pi}{3}\right)$
- Simplify to a single trigonometric ratio using the appropriate identity from **1.** and evaluate.
 - $\sin 34^\circ \cos 4^\circ - \cos 34^\circ \sin 4^\circ$
 - $\cos^2 \frac{\pi}{8} - \sin^2 \frac{\pi}{8}$
 - $\sin\left(\frac{-5\pi}{8}\right) \cos\left(\frac{-5\pi}{8}\right)$
- Use an appropriate formula to find the exact value of : **a)** $\sin\left(\frac{11}{12}\pi\right)$ **b)** $\cos\left(\frac{7}{12}\pi\right)$
- If $\csc \beta = \frac{-13}{5}$ where $270^\circ \leq \beta \leq 360^\circ$, determine the following. (Include a detailed diagram.)
 - the measure of the related acute angle to the nearest degree
 - the measure of β to the nearest degree.
 - exact primary trigonometric values of β
 - an exact value for $\cos 2\beta$
 - an exact value for $\sin 2\beta$
- If $\cot \alpha = \frac{-4}{3}$, and α is a second quadrant angle, determine the following. (Include a detailed diagram.)
 - the related acute angle to the nearest degree
 - the principal angle to the nearest degree
 - a negative co-terminal angle with the principal angle
 - exact values for the primary trigonometric ratios
 - an exact value for $\tan 2\alpha$
 - an exact value for $\sin\left(\frac{\pi}{3} - \alpha\right)$

10. Prove the following identities:

a) $\frac{\cos x}{1 - \sin x} - \tan x = \sec x$

b) $\frac{1}{1 + \cos \theta} = \csc^2 \theta - \csc \theta \cot \theta$

c) $\frac{\cos 2x}{1 + \sin 2x} = \frac{\cot x - 1}{\cot x + 1}$

d) $\frac{\cos \theta - \sin 2\theta}{\cos 2\theta + \sin \theta - 1} = \cot \theta$

11. Solve for x where $0 \leq x \leq 2\pi$. Answer to the nearest hundredth of a radian if necessary.

a) $\sec x = -6.658$

b) $\tan^2\left(\frac{x}{2}\right) - 1 = 0$

c) $\sin 2x - 1 = 0$

d) $\sin 2x = \cos x$

e) $7 \sin x + \cos 2x = -3$

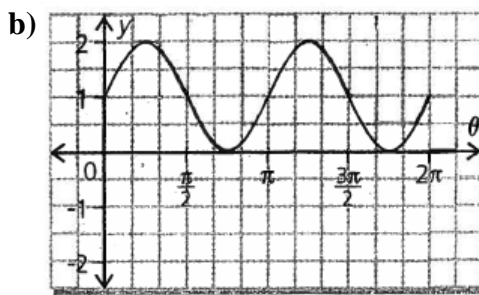
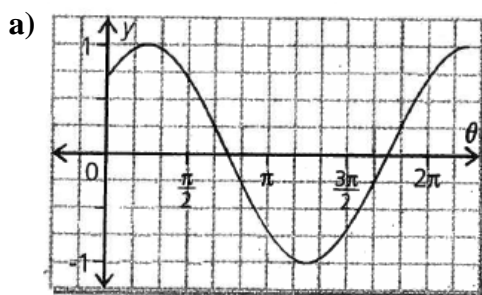
f) $3 \cos 2x + \cos x + 1 = 0$

12. Solve for x where $x \in [-2\pi, 0]$. Answer to the nearest hundredth of a radian if necessary.

a) $4 \sin x - 3 \cos^2 x = 0$

b) $2 \sin\left(x - \frac{2\pi}{3}\right) = 1$

13. For each of the following graphs determine an equation of the sine function $y = a \sin k(\theta - d) + c$ and the cosine function $y = a \cos k(\theta - d) + c$ by finding appropriate values for a , k , d and c .



14. For each of the following state any reflections, the amplitude, period, phase shift and vertical translation. Graph the curve as indicated.

a) $y = 3 \sin\left(x + \frac{\pi}{3}\right)$ for one cycle and state the domain and range

b) $y = -\frac{1}{2} \sin 3\left(x - \frac{\pi}{4}\right) - \frac{1}{2}$, $-\pi \leq x \leq \frac{\pi}{2}$

c) $y = -2 \cos\left(2x - \frac{\pi}{3}\right) - 1$ for $-\frac{\pi}{2} \leq x \leq \pi$

15. A Ferris wheel has a diameter of 18 m and rotates at the rate of 5 revolutions every 2 minutes. Passengers get on at the lowest point which is 2 m above the ground.

a) Draw a graph showing the height, h , in metres above the ground after t seconds for two cycles.

b) Determine an equation for the function graphed in a.

c) Use the equation to determine to 1 decimal place:

i) a passenger's height above the ground after 1.75 minutes

ii) the times in the first rotation the rider will be 18 m above the ground

16. Find the points of intersection of the curves $f(x) = \cos 2x$ and $g(x) = \sin x$ for $-\pi \leq x \leq \pi$. Illustrate your solution graphically and then state the solution set for $f(x) < g(x)$.

17. Graph each of the following on the same grid for the indicated domain.

a) $f(x) = -2 \sin 2x$ & $y = \frac{1}{f(x)}$, $x \in [-\pi, 0]$ b) $f(x) = 3 \cos \frac{1}{2}x + 1$ & $y = |f(x)|$, $x \in [-2\pi, 2\pi]$

Answers

3. a) $\frac{13\pi}{12}$ b) 392° 4. a) $\frac{7\pi}{3}$ b) -132° c) 200° d) $\frac{7\pi}{6}$ 5. a) -1 b) $-\sqrt{2}$ c) dne d) $-\sqrt{3}$ e) -1 f) $-\frac{1}{\sqrt{3}}$

6. a) $\sin 30^\circ = \frac{1}{2}$ b) $\cos \frac{\pi}{4} = \frac{1}{\sqrt{2}}$ c) $\frac{1}{2} \sin\left(-\frac{5\pi}{4}\right) = \frac{\sqrt{2}}{4}$ 7. a) $\frac{\sqrt{6}-\sqrt{2}}{4}$ b) $\frac{\sqrt{2}-\sqrt{6}}{4}$

8. a) 23° b) 337° c) $\sin \beta = -\frac{5}{13}$, $\cos \beta = \frac{12}{13}$, $\tan \beta = -\frac{5}{12}$ d) $\frac{119}{169}$ e) $-\frac{120}{169}$

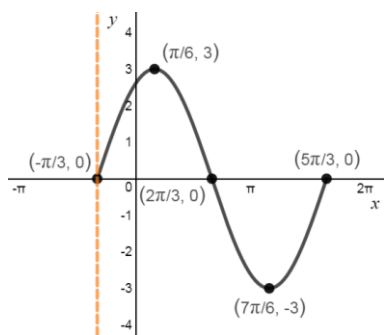
9. a) 37° b) 143° c) -217° d) $\sin \alpha = \frac{3}{5}$, $\cos \alpha = -\frac{4}{5}$, $\tan \alpha = -\frac{3}{4}$ e) $-\frac{24}{7}$ f) $\frac{-4\sqrt{3}-3}{10}$

11. a) 1.72, 4.56 b) $\frac{\pi}{2}$, $\frac{3\pi}{2}$ c) $\frac{\pi}{4}$, $\frac{5\pi}{4}$ d) $\frac{\pi}{6}$, $\frac{\pi}{2}$, $\frac{5\pi}{6}$, $\frac{3\pi}{2}$ e) $\frac{7\pi}{6}$, $\frac{11\pi}{6}$ f) $\frac{\pi}{3}$, 2.30, 3.98, $\frac{5\pi}{3}$

12. a) -5.72 , -3.70 b) $-\frac{7\pi}{6}$, $-\frac{\pi}{2}$

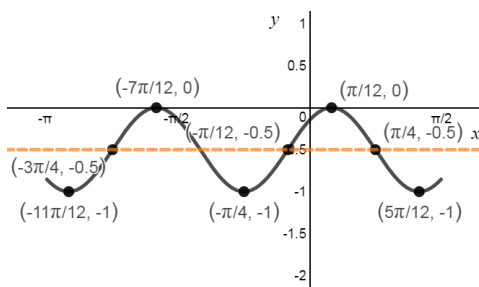
13. a) $y = \sin\left(\theta + \frac{\pi}{4}\right)$, $y = \cos\left(\theta - \frac{\pi}{4}\right)$ b) $y = \sin 2\theta + 1$, $y = \cos 2\left(\theta - \frac{\pi}{4}\right) + 1$

14. a)

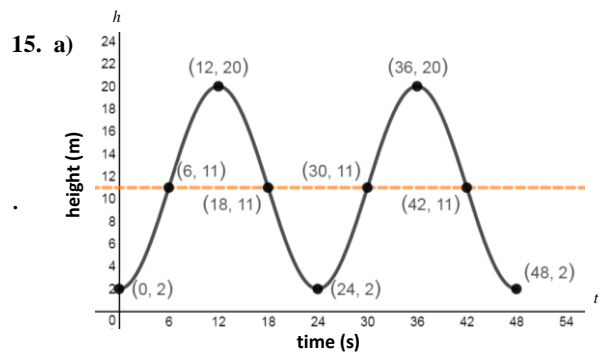
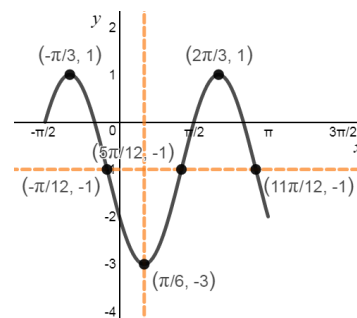


$$D = \left\{ x \in \mathbb{R} \mid -\frac{\pi}{3} \leq x \leq \frac{5\pi}{3} \right\}, R = \{ y \in \mathbb{R} \mid -3 \leq y \leq 3 \}$$

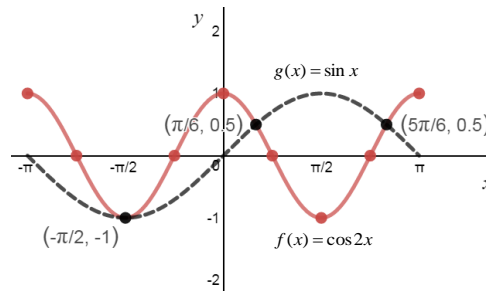
b)



c)



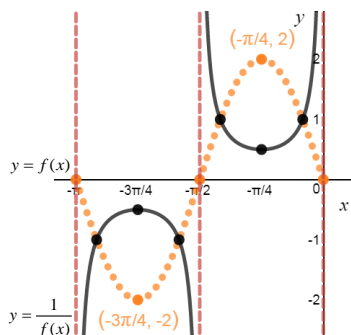
16. $\left(-\frac{\pi}{2}, -1\right), \left(\frac{\pi}{6}, \frac{1}{2}\right), \left(\frac{5\pi}{6}, \frac{1}{2}\right); \left\{ x \in \mathbb{R} \mid \frac{\pi}{6} < x < \frac{5\pi}{6} \right\}$



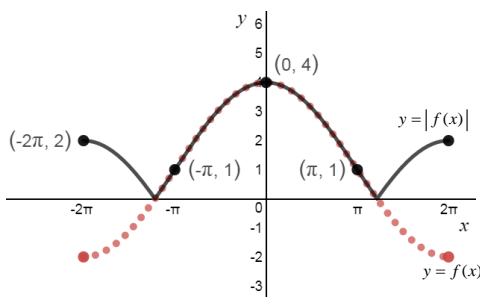
b) $h(t) = -9\cos\left(\frac{\pi}{12}t\right) + 11$ or $h(t) = 9\sin\left[\frac{\pi}{12}(t-6)\right] + 11$

c) i) 17.4 m ii) 9.4 seconds, 14.6 seconds

17. a)



b)



Date: _____

EXAM REVIEW UNITS 5 & 61. Review the **Exponent Laws** from Unit 5: Day 1.

2. Evaluate each of the following:

$$\text{a) } \frac{5^{-2}}{3^{-3}} \quad \text{b) } \frac{2^{-1} + 4^{-1}}{3^{-2}} \quad \text{c) } \frac{4^{\frac{3}{2}} - 8^{\frac{1}{3}}}{16^{\frac{1}{4}} \times 25^{\frac{1}{2}}} \quad \text{d) } \left(\frac{1}{4} - \frac{9}{100}\right)^{\frac{3}{2}} \quad \text{e) } \frac{3^{-12} + 3^{-11}}{3^{-12} - 3^{-13}}$$

3. Simplify to a single power and evaluate.

$$\text{a) } \frac{3^{n+1} \times 9^{n-4}}{27^{n-2}} \quad \text{b) } \frac{4^{3x-1} \times 16^x}{32^{2x} \times 8}$$

4. Simplify and write your final answer with positive exponents.

$$\text{a) } (2x^4 y^{-2})^2 \cdot (x^4 y^3)^{-1} \quad \text{b) } \sqrt[3]{\frac{\sqrt{x} \cdot \sqrt[3]{x^2}}{x^{-1}}}$$

5. Rewrite each expression as the sum and/or difference of terms, where each term is of the form ax^n .

$$\text{a) } \frac{4x^5 - 5x^4 + 6x - 2}{2x^4} \quad \text{b) } \frac{x^3 + 27}{x + 3} \quad \text{c) } \frac{1}{\sqrt{x}} \left(x^2 + \frac{1}{2x}\right)^2 \quad \text{d) } \frac{x-4}{\sqrt{x}-2}$$

6. Completely factor each of the following expressions.

$$\text{a) } -2t(1-t)^4 + 4t^2(1-t)^3 \quad \text{b) } 10(2x+1)^4(3x+2)^4 + 12(2x+1)^3(3x+2)^5$$

$$\text{c) } 12x(2x^2 - 1)^2(x^2 - 2)^{-2} - 4x(x^2 - 2)^{-3}(2x^2 - 1)^3$$

7. Review the **Logarithm Laws and Properties** from Unit 6: Day 3

8. Change to exponential form.

$$\text{a) } \log_9 3 = \frac{1}{2} \quad \text{b) } \log\left(\frac{1}{100}\right) = -2$$

9. Change to logarithmic form.

$$\text{a) } 3^2 = 9 \quad \text{b) } e^0 = 1$$

10. Evaluate each of the following exactly.

$$\text{a) } \log_{\sqrt{3}} 1 \quad \text{b) } \log_4\left(\frac{1}{64}\right) \quad \text{c) } \log_5 5^{\frac{1}{2}} \quad \text{d) } e^{\ln 3^{-2}} \quad \text{e) } \log_2(-1)$$

11. Use the properties of logarithms to write each of the following as a sum and/or a difference of logarithms.

$$\text{a) } \log_8 \sqrt[4]{m} \quad \text{b) } \ln\left[\frac{x^3(x-2)^4}{\sqrt{x^2+1}}\right]$$

12. Simplify to a single logarithm using the logarithm laws and evaluate.

$$\text{a) } \log_6 3 + \log_6 12 \quad \text{b) } \log_2 15 - \log_2 24 - \log_2 5 \quad \text{c) } \frac{\log_7 \sqrt{8}}{\log_7 2}$$

(Use change of base formula)

13. Solve each of the following. (* means answer to 2 decimal places, otherwise answer exactly)

a) $3(5^{x^2+3x}) = \frac{3}{25}$

b) $5^{x-3} - 5^{x-1} + 120 = 0$

c) $3^{2x} - 3^x - 12 = 0$ *

d) $\log_x 27 = \frac{3}{2}$

e) $\log_7 x = \frac{1}{3} \log_7 27 + \frac{2}{3} \log_7 8$

f) $4(7^{x-2}) = 8$ *

g) $\ln(\log_4 x^2) = 0$

h) $\log_9(x-5) + \log_9(x+3) = 1$

i) $\log_2(x+4) - \log_2(x-3) = 3$

j) $(\ln x)^2 + \ln x^2 = 0$

k) $e^{2x} - 5e^x - 24 = 0$

l) $x = \log_2 80$ *

(Use change of base formula)

14. A photocopier, which originally cost \$500 000, depreciates exponentially in value by 10% each year. What will be the photocopier's value in five years to the nearest hundred dollars?

15. In 1947, an investor bought Vincent van Gogh's painting *Irises* for \$84 000. In 1987, she sold it for \$49 million. What was the annual exponential growth rate for this investment? (to the nearest percent)

16. In a recent dig, a human skeleton was unearthed. It was later found that the amount of Carbon 14 in it had decayed to $\frac{1}{\sqrt{8}}$ of its original amount. If Carbon-14 has a half-life of 5760 years, how old is the skeleton? (Use "a" for its original amount.)

17. A radioactive substance decays from 20 g to 15 g in 7 hours. Determine the half-life of the substance, to the nearest minute.

18. Graph the following by naming and applying transformations on an appropriate function. Then, find the domain, range, intercept(s) and asymptote(s). (A table of values may be included.)

a) $f(x) = -\frac{1}{2} \left(\frac{1}{3}\right)^x + 2$

b) $y = 2e^{x-1} - 2$

c) $y = \log_2 \left(\frac{x^3}{8}\right)$

d) $f(x) = \ln(2-x)$

Answers

2. a) $\frac{27}{25}$ b) $\frac{27}{4}$ c) $\frac{3}{5}$ d) $\frac{125}{8}$ e) 6 3.a) $3^{-1} = \frac{1}{3}$ b) $2^{-5} = \frac{1}{32}$ 4. a) $\frac{4x^4}{y^7}$ b) $x^{\frac{13}{18}}$

5. a) $2x - \frac{5}{2} + 3x^{-3} - x^{-4}$ b) $x^2 - 3x + 9$ c) $x^{\frac{7}{2}} + x^{\frac{1}{2}} + \frac{1}{4}x^{-\frac{5}{2}}$ d) $x^{\frac{1}{2}} + 2$

6. a) $-2t(1-t)^3(1-3t)$ b) $2(2x+1)^3(3x+2)^4(28x+17)$ c) $4x(2x^2-1)^2(x^2-2)^{-3}(x^2-5)$

8. a) $9^{\frac{1}{2}} = 3$ b) $10^{-2} = \frac{1}{100}$ 9. a) $2 = \log_3 9$ b) $0 = \log_3 1$ or $0 = \ln 1$ 10. a) 0 b) -3 c) $\frac{1}{2}$ d) $\frac{1}{9}$ e) dne

11. a) $\frac{1}{4} \log_8 m$ b) $3 \ln x + 4 \ln(x-2) - \frac{1}{2} \ln(x^2+1)$ 12. a) $\log_6 36 = 2$ b) $\log_2 \left(\frac{1}{8}\right) = -3$ c) $\log_2 \sqrt{8} = \frac{3}{2}$

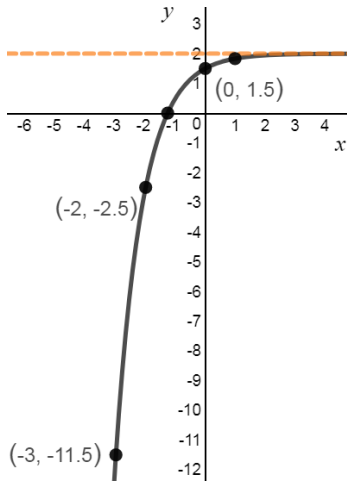
13. a) -2, -1 b) 4 c) 1.26 d) 9 e) 12 f) 2.36 g) -2, 2 h) 6 i) 4 j) $1, \frac{1}{e^2}$ k) $\ln 8$ l) 6.32

14. \$295 200 15. 17% 16. 8 640 years 17. 16 hours & 52 minutes

18. a) Transformations on $y = \left(\frac{1}{3}\right)^x$ are:

- i) reflection in the x -axis
- ii) vertical stretch by a factor of $\frac{1}{2}$
- iii) vertical translation up 2 units

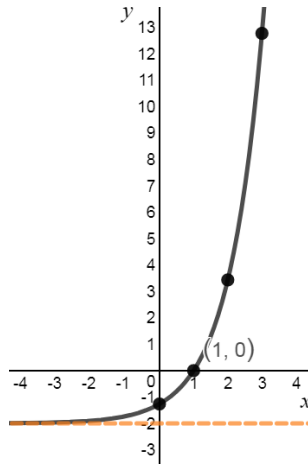
$D = \{x \in \mathbb{R}\}$, $R = \{y \in \mathbb{R} \mid y < 2\}$
 x -int is $\log_3 4$ or ≈ -1.3 , y -int is 1.5
 horizontal asymptote is $y = 2$



b) Transformations on $y = e^x$ are:

- i) vertical stretch by a factor of 2
- ii) horizontal translation right 1 unit
- iii) vertical translation down 2 units

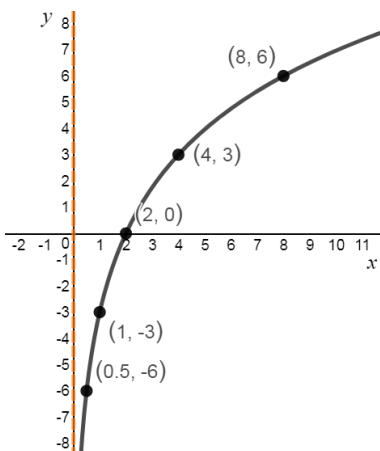
$D = \{x \in \mathbb{R}\}$, $R = \{y \in \mathbb{R} \mid y > -2\}$
 x -int is 0, y -int is ≈ -1.3
 horizontal asymptote is $y = -2$



c) Transformations on $y = \log_2 x$ are:

- i) vertical stretch by a factor of 3
- ii) vertical translation down 3 units

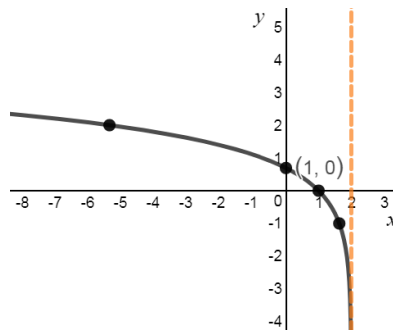
$D = \{x \in \mathbb{R} \mid x > 0\}$, $R = \{y \in \mathbb{R}\}$
 x -int is 2, no y -int
 vertical asymptote is $x = 0$



d) Transformations on $y = \ln x$ are:

- i) reflection in the y -axis
- ii) horizontal translation right 2 units

$D = \{x \in \mathbb{R} \mid x < 2\}$, $R = \{y \in \mathbb{R}\}$
 x -int is 1, y -int is $\ln 2$ or ≈ 0.7
 vertical asymptote is $x = 2$



Date: _____

EXAM REVIEW UNITS 7 & 8**UNIT 7**

1. Given $f = \{(0,4), (1,2), (2,1), (4,5)\}$ and $g = \{(0,0), (1,1), (4,2), (9,3)\}$, determine each of the following, if possible.

- a) $(f \circ f)(0)$ b) $(g - f)(1)$ c) $(f \circ g)(4)$ d) g^{-1} e) $(g^{-1} \circ g)(3)$ f) $f \circ g$

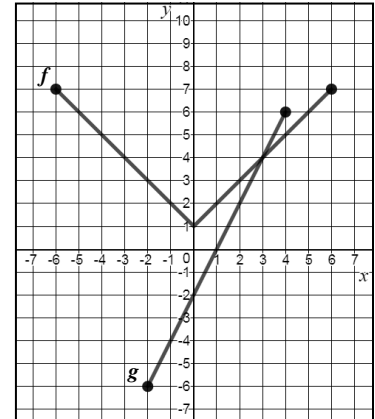
2. Use the graphs of f and g to determine each of the following, if possible.

- a) $(g \circ f)(-2)$ b) $(f \circ g)(-2)$ c) $(g \circ g)(0)$

- d) $(fg)(-1)$ e) $\left(\frac{f}{g}\right)(1)$ f) $(f + g)(3)$

- g) D_{f-g} h) the **graph** of $h = f - g$

- i) the equation of h expressed as a **piecewise** function



3. Given $f(x) = \frac{2+x}{x}$, $g(x) = x^2 + 2x$, $h(x) = \sqrt{4-x}$, $p(x) = \csc x$ and $q(x) = \log_2 x$, find:

- a) $g(f(-1))$ b) $(f \circ g)(-2)$ c) $(f + h)(-12)$ d) $(q \circ h)(-60)$

- e) D_{q+h} f) $f^{-1}(x)$ and show that $(f \circ f^{-1})(x) = x$ g) x , if $f(x) = g(x)$

- h) x , if $(g \circ h)(x) = 0$ i) x for $-2\pi \leq x \leq 0$, if $(f \circ p)(x) = 2$ j) $(f \times g)(x)$ and **graph**

4. The number, N , of bacteria in a culture at time t is given by $N(t) = 2000 \left[30 + te^{-\frac{t}{20}} \right]$.

If the bacterial culture is placed into a colony of mice, the number of mice, M , that become infected is related to the number of bacteria present by the equation

$M(N) = \sqrt[3]{N+1000}$. After ten days, how many mice are infected?

5. A firm can sell x units of a product daily at p dollars per unit, where $x = 1000 - p$.

The cost, C of producing x units per day is $C(x) = 3000 + 20x$.

a) Find the revenue function, $R(x)$.

b) Find the profit function, $P(x)$.

c) What price per unit will maximize profit? What is the maximum daily profit?

UNIT 8

Redo Unit 8 Test Review.

Answers

1. a) 5 b) -1 c) 1 d) $g^{-1} = \{(0,0), (1,1), (2,4), (3,9)\}$ e) undefined f) $f \circ g = \{(0,4), (1,2), (4,1)\}$

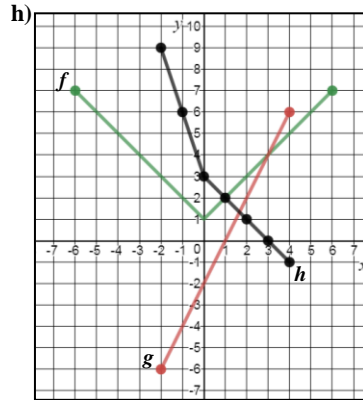
2. a) 4 b) 7 c) -6 3. a) -1 b) dne c) $\frac{29}{6}$ d) 3 e) $D_{q+h} = \{x \in \mathbb{R} | 0 < x \leq 4\}$

d) -8 e) undefined f) 8

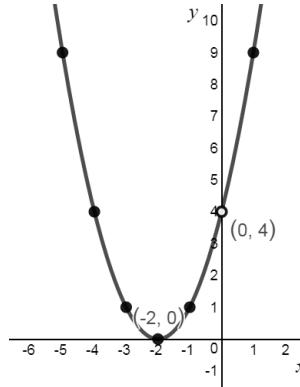
f) $f^{-1}(x) = \frac{2}{x-1}$ g) -2, -1, 1 h) 4 i) $-\frac{11\pi}{6}, -\frac{7\pi}{6}$

g) $D_{f-g} = \{x \in \mathbb{R} | -2 \leq x \leq 4\}$

j) $(f \times g)(x) = (x+2)^2$, hole at (0,4)



i) $h(x) = \begin{cases} -3x+3 & \text{if } -2 \leq x \leq 0 \\ -x+3 & \text{if } 0 < x \leq 4 \end{cases}$



4. 41.8

5. a) $R(x) = -x^2 + 1000x$ b) $P(x) = -x^2 + 980x - 3000$ c) \$510 if $x = 490$, \$237 100