Instructions: Answer all questions. Show all work.

1.   Find the domain of each of the following functions. Express your answer in interval notation.

a) $f(x) = \dfrac{x-5}{\sqrt{3x-6}}$

b) $g(x) = \dfrac{\sqrt{3x-6}}{x-5}$

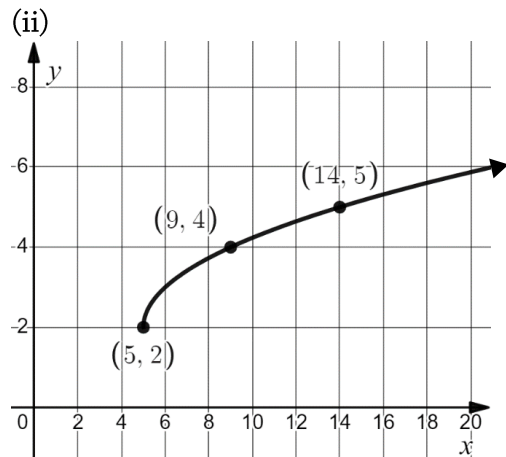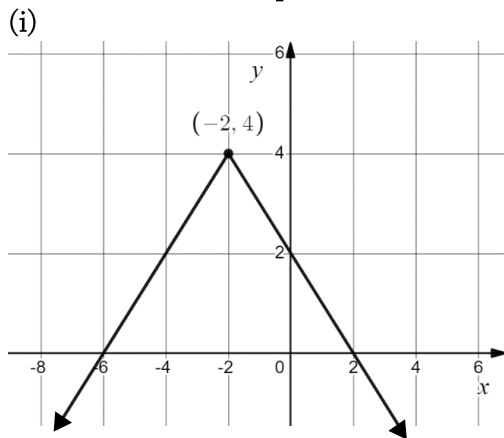c) $h(x) = \dfrac{x-5}{3x^2+5x-2}$

2.   Let $f(x) = 3x^2 - 5x + 7$. Find and <u>simplify</u>:

a) $f(a)$

b) $f(a+h)$

c) $\dfrac{f(a+h)-f(a)}{h} \;\; (h \neq 0)$

3.   a)   Write an equation for each of the following graphs (each of which represents a transformation of a parent function):

(i)

(ii)

b)   Sketch the graph of each of the following functions. Label the <u>coordinates</u> of any x- and y-intercepts. Write the <u>equations</u> of the vertical and horizontal asymptotes, where appropriate.

(i) $y = 1 - (x-2)^3$ (Describe the "end behavior".)

(ii) $y = 3\sin(2x)$ in the interval $[0, 2\pi]$

(iii) $y = \dfrac{1}{x+2} - 3$

4.   Let $f(x) = 5 - 6x^2$ and $g(x) = 3x - 4$.
a)   Evaluate $(g \circ f)(-3)$.
b)   Find $(f \circ g)(x)$ and <u>simplify</u>.

5. Let $f(x) = \dfrac{5x - 2}{3x + 4}$.

    a)   Find $f^{-1}(x)$ and its domain. (Express in interval notation.)

    b)   Compute $f^{-1}(-1)$.

6. Let $f(x) = 2x^2 + 12x + 10$

    a)   Express $f(x)$ in standard vertex form.

    b)   Sketch the graph of $y = f(x)$ and clearly label the coordinates of the vertex and any x- and y-intercepts.

    c)   State the maximum or minimum value of $f(x)$.

7. Solve each of the following for x. Round each answer to <u>four</u> decimal places when necessary.

    a) $27^{3x-2} = 81^{x+1}$

    b) $\log_{12}(x - 6) + \log_{12}(x + 1) = 2$

    c) $6 + 2e^{3-x} = 7$

8. <u>Without</u> using your calculator, evaluate the following expressions. Show <u>all</u> work necessary:

    a) $\log_8\left(\dfrac{1}{4}\right)$

    b) $\log_{20} 200 + \log_{20} 50 - \log_{20} 25$

    c) $\sin\left(\dfrac{\pi}{6}\right)\cos\left(\dfrac{\pi}{12}\right) + \cos\left(\dfrac{\pi}{6}\right)\sin\left(\dfrac{\pi}{12}\right)$

    d) $\sec\left(\tan^{-1}\left(\dfrac{8}{15}\right)\right)$

9. John invests \$ 5,000 in an account paying 11% interest compounded continuously.

    a)   How much money will be in his account after 8 years? (Round the answer to closest cent.)

    b)   How long will it take for his initial amount of \$ 5,000 to be doubled? (Round the answer to <u>one</u> decimal place.)

10. If $\sin A = \dfrac{3}{5}$ where $\angle A$ is in Quadrant II and $\cot B = -\dfrac{12}{5}$ where $\angle B$ is in Quadrant IV, find:

    a) $\sec A$

    b) $\sin 2B$

    c) $\cos(A - B)$

    d) $\cos^2 A$

11. Verify the identity: $\tan x + \cot x = \cot x \sec^2 x$

12. Solve for x on the interval $[0, 2\pi)$: $-3 \cos x + 3 = 2 \sin^2 x$