

Question 1:

(a)[4 points] Expand and simplify:

$$3(x + 2)^2 - 2(x + 3)(x - 5)$$

(b)[3 points] Factor completely:

$$6x^2 + 5x - 6$$

(c)[3 points] Write as a simplified fraction using only positive exponents:

$$(y^{-1} - x^{-1})(x - y)^{-1}$$

Question 2:

(a)[4 points] Solve for x :

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

(b)[3 points] Rationalize the denominator:

$$\frac{1}{\sqrt{x+h} - \sqrt{x}}$$

(c)[3 points] Solve and state your answer using interval notation:

$$\left(x - \frac{4}{3}\right)(x + 1) \leq 0$$

Question 3:

(a)[4 points] Solve and state your answer using interval notation

$$|3x - 8| \leq 7$$

(b)[3 points] Find the equation of the line through $(-1, 4/3)$ and $(3, 10/3)$.

(c)[3 points] Find the distance between the points $(5, 2)$ and $(8, -2)$.

Question 4:

(a)[5 points] Put the quadratic function $f(x) = -2x^2 - 4x - 5$ into standard form by completing the square. State the vertex and axis of symmetry of the graph of $f(x)$.

(b)[5 points] Use your result in (a) to sketch the graph of $y = -2x^2 - 4x - 5$. Label and indicate the scale on your axes, and label the vertex.

Question 5:

(a)[5 points] Find the point of intersection of the pair of lines

$$2x - y = 2$$

$$x + y = -1/2$$

(b)[5 points] Find the equation of the line through $(-2, 7)$ which is perpendicular to the line

$$y = \frac{1}{3}x - \frac{5}{7}.$$

Question 6:

(a)[3 points] Find the domain of $f(x) = \frac{\sqrt{x}}{\sqrt{4-x}}$.

(b)[4 points] Find the inverse $f^{-1}(x)$ of $f(x) = \frac{\sqrt{x}}{\sqrt{4-x}}$.

(c)[3 points] If $f(x) = \frac{\sqrt{x}}{\sqrt{4-x}}$ and $g(x) = \frac{1}{x^2}$, find and simplify $(g \circ f)(x)$.

Question 7:

(a)[3 points] Determine if $x = 1$ is a zero of $x^4 + 2x^3 - 7x^2 - 8x + 12$.

(b)[3 points] Find the remainder upon dividing $x^4 + 2x^3 - 7x^2 - 8x + 12$ by $x + 3$.

(c)[4 points] Use (a) and (b) to completely factor $x^4 + 2x^3 - 7x^2 - 8x + 12$.

Question 8:

(a)[3 points] Convert -405° to radians.

(b)[4 points] Find $\sec(10\pi/3) \sin(-3\pi/4)$.

(c)[3 points] If $\cos(t) = -1/5$, find all possible values of $\sin(t)$.

Question 9:

(a)[7 points] Carefully sketch the graph of $f(x) = -\frac{1}{2} \sin [2(x - \pi/4)]$. Label and indicate the scale on your axes.

(b)[3 points] State the period, amplitude and phase-shift of the function graphed in (a).

Question 10:

(a)[4 points] One population has size $P_1(t)$ at time t years given by $P_1(t) = 1000e^{0.05t}$. A second population has size $P_2(t)$ at time t years given by $P_2(t) = 800e^{0.08t}$. At what time t will the two populations be equal in size?

(b)[6 points] Solve for x :

$$\log_{10}(3x) - \log_{10}(x + 1) = \log_{10} x$$