

Q1- Answer the following questions:

A. Find the domain and range of the following functions:

1. $f(x) = -\sqrt{2-x}$

2. $f(x) = 3 + \sqrt{16-x^2}$

3. $f(x) = 1 + \frac{3}{x-3}$

B. Decide whether the following equation defines a one-to-one function.

If so, find the equation of the inverse: $f(x) = (x-2)^3$

Q2. Answer the following questions:

A. Find the equations of the tangent lines to the curve $\sin(x+y) = 2x - 2y$, at the point (π, π) .

B. Find second derivative of the parametric curve:

$x = 5t^3 + 6t$ and $y = t^4 - 3$

Q3. Answer the following:

A. If $g(x) = \frac{\cos(x)+2}{\sin(x)}$ with $\sin(x) \neq 0$, then find $g'(\frac{\pi}{2})$

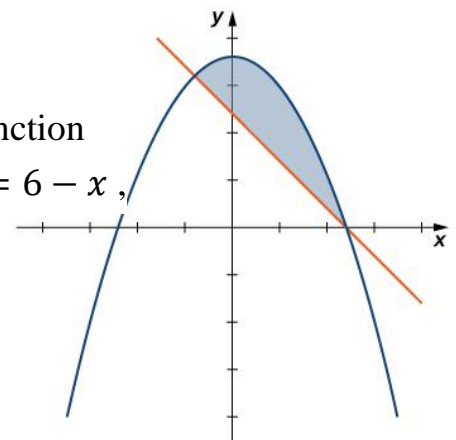
B. Find the approximate value of $f(5.001)$, where $f(x) = x^3 - 7x^2 + 15$

Q4. Answer the following:

A. Find the local extrema (maxima and minima) for the function,

$$f(x) = x^3 - 3x + 5$$

B. If R is the region bounded above by the graph of the function $f(x) = 9 - (\frac{x}{2})^2$ and below by the graph of the function $f(x) = 6 - x$, find the Area of the region R.



Q5- Answer the following questions:

A. Find the domain and range of the following functions:

1. $f(x) = \frac{1}{x+3} - 5$ 2. $f(x) = 2\sqrt{x+4}$
3. $f(x) = \sqrt{-2-x}$ 4. $f(x) = \frac{1}{x-4}$

B. Given $h(x) = \frac{x+4}{2x-5}$ find $h^{-1}(x)$. Then find $(h \circ h^{-1})(x)$.

Q6. Answer the following questions:

A. Find y' for each of the following:

1. $x^3y^5 + 3x = 8y^3 + 1$
2. $x^2 \tan y + y^{10} \sec x = 2x$

B. Find $\frac{d^2y}{dx^2}$ as a function of t if: $x = t^3 + 3t^2$ and $y = t^4 - 8t^2$

Q7. Answer the following:

A. Find the derivative of:

$$y = \frac{\sin^2 x}{\cos^2 x}$$

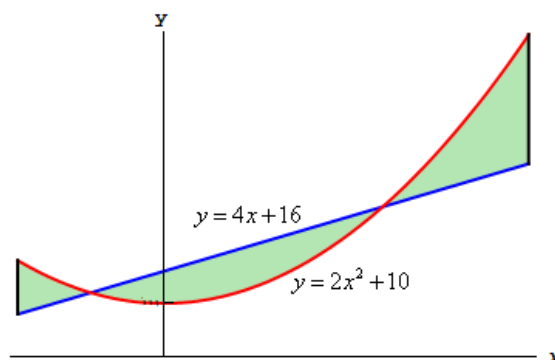
B. Use differentials to find the approximate value of $\sqrt{36.1}$

Q8. Answer the following:

A. Evaluate this integral:

$$\int \sin^5 x \, dx$$

B. Determine the area of the region bounded by $y = 2x^2 + 10$ and $y = 4x + 16$. $x = -2$ and $x = 5$



Q9- Answer the following questions:

A. Sketch the following functions stating the domain and range of each:

5. $f(x) = 3x - x^2$

6. $f(x) = (x - 1)^2 + 1$

B. Determine by composition whether each pair of functions are inverses: (Find the composition $f(g(x))$)

and $g(f(x))$ $f(x) = \frac{2}{3}x + 6$ and $g(x) = \frac{3}{2}x - 9$

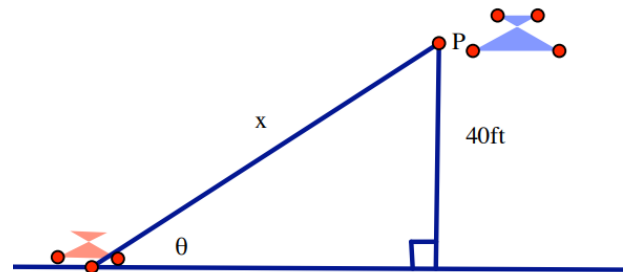
Q10. Answer the following questions:

A. Find the derivative of $\frac{y^2 + x^3}{y^3 - x^2} = x$ at (1, 1).

B. Find $\frac{d^2y}{dx^2}$ as a function of t if: $x = t^3 + 3t^2$ and $y = t^4 - 8t^2$

Q11. Answer the following:

A police car is parked 40 feet from the road at the point P in the shown diagram. Your vehicle is approaching on the road as in the shown diagram and the police are pointing a radar gun at your car. Let x denote the distance from your car to the police car and let θ be the angle between the line of sight of the radar gun and the road. How fast is x changing with respect to θ when $\theta = \frac{\pi}{4}$?



Q12. A dynamite blast blows a heavy rock straight up with a launch velocity of 160 ft/sec. Its height is given by $s = -16t^2 + 160t$.

- I. How high does the rock go? (Maximum Hight)
- II. What is the velocity when the rock is 256 ft. above the ground on the way up? On the way

