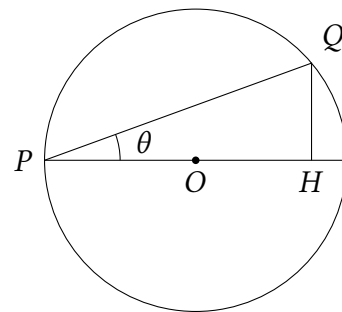


Please make an effort to *write neatly*, and *insert a few words* here and there to get your ideas across. It's difficult to understand (and evaluate) mathematics in the absence of guiding words.

You may write your solutions by hand, but it would be terrific if you could do it in \LaTeX . In any case, upload your solutions to the course's site on Blackboard by the midnight of Wednesday February 7.

- [3 pts] Let $f(x) = x^3 + 1$. Find the inverse function f^{-1} .
- [3 pts] Let $\mathbf{a} = \langle 1, 1, 1 \rangle$ and $\mathbf{b} = \langle 1, 2, 3 \rangle$. Evaluate the cross product $\mathbf{a} \times \mathbf{b}$.
- [3 pts] Find the equation of the tangent line to the parabola $y = x^2$ at $x = 2$.
- [3 pts] S is the sphere of radius 1 centered at the origin in the xyz Cartesian coordinate system. Verify that the point P with coordinates $\left(\frac{\sqrt{3}}{4}, \frac{3}{4}, \frac{1}{2}\right)$ lies on the sphere. Find the equation of the tangent plane to the sphere at P .

- [3 pts] In the adjacent diagram the radius of the circle is a . What is the length of PH ?



- [6 pts] Find the length of the parabolic arc $y = x^2$, $0 \leq x \leq 1$.
- [6 pts] Find the length of the parametrically defined curve

$$\mathbf{r}(t) = \langle t - \sin t, 1 - \cos t \rangle, \quad 0 \leq t \leq 2\pi.$$

- [6 pts] Consider the graph of $z = x^2 - y^2 + 5$ in the Cartesian coordinates. Find the surface area of the part of that graph that lies above the disk $x^2 + y^2 \leq 1$.