**Homework 7 - Math 140** **Name:** _____

*Calculate the following derivatives.*

1. $\frac{d}{dx} 6\sqrt{x}$

2. $\frac{d}{dx} \frac{3}{x^2}$

3. $\frac{d}{dt} 16t^2 - 64t + 100$

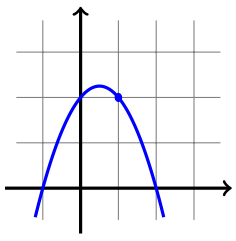
4. $\frac{d}{dp} \left(p^{-2} - p^2\right)$

5. $\frac{d}{dt} 2t^3(t^2 + \sqrt{t})$

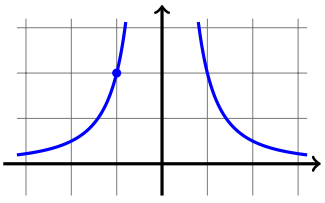
6. $\frac{d}{dx}(x-5)(x+3)$

*Find the slope of the tangent line for the following functions at the indicated point.*

7. $y = 4 - 3x - x^2$ at $x = 1$.



8. $y = \frac{4}{x^2}$ at $x = -1$.



*Where do the following functions have horizontal tangent lines? Hint: find the derivatives first, then solve for when the derivative equals zero.*

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

10. $y = \frac{1}{5}x^5 - \frac{7}{4}x^4 + 4x^3$.

*Solve the following.*

11. A company estimates that if they hire $L$ workers, the output of their factor will be $Q(L) = 600L^{2/3}$. Find the derivative $Q'(x)$, then use $Q'(1000)$ to estimate how much output will increase if they have 1,000 workers and hire one more.

12. A ball thrown in the air has a height of $h(t) = 6 + 29t - 16t^2$ feet, where $t$ is time in seconds. If the ball hits the ground at $t = 2$ seconds, calculate how fast the ball is falling then. Recall that velocity is the derivative of the position (i.e., the height).