Math 261 – Summer Lab 7 **Derivatives** Name_____

Show all work for credit. Also, give exact answers unless otherwise noted.

1. Let $f(x) = x^3 - 3x + 7$.

   (a) Use the definition to find the derivative.

   (b) Find $f'(2)$.

   (b) Find an equation of the tangent line to the graph of *f* at the point whose *x*-coordinate is –2.

   (c) Find the points on the graph of *f* at which the tangent line is horizontal.

   (d) Find the points on the graph of *f* at which the tangent line is parallel to the line $24x - y = 17$.

   (e) Find an equation of the normal line to the graph of *f* at the point whose *x*-coordinate is ½.

2. Find the derivative of each of the following functions. Simplify your answers completely.

   (a) $f(x) = 2x^5 - 4x^4 + \frac{2}{3}x^3 - x + 10$

   (b) $s(t) = t^5 - \pi t^3 + \pi^3 t - \pi^2 - \sqrt{2}$

(c) $w(u) = 2u\sqrt[3]{u^2} - u\sqrt[3]{u} - \dfrac{3}{u}$

(d) $p(q) = (q^4 + q^3 + q^2 + q + 1)(q - 1)$

(e) $a(b) = \dfrac{5b^4 - 3b^3 + 7}{b^2}$

(f) $y(x) = (x^3 + \sqrt{x} - 1)\cos x$

(g) $g(z) = \dfrac{z^2 - 4}{2z + 5}$

(h) $v(t) = \tan t \csc t$

(i) $A(\theta) = \dfrac{5\tan\theta}{(2\theta + 1)^2}$

(j) $M(\varphi) = \sin(2\varphi)$

3. Find the following higher order derivatives.

(a) Find $f''(x)$ if $f(x) = x\sqrt[5]{x^2} + \dfrac{4}{x}$.

(b) Find $q''(p)$ if $q(p) = \sqrt{p}\cos p$.

(c) Find $g^{(17)}(\alpha)$ if $g(\alpha) = \sin\alpha$.