Name____________________________________ **Date**_______________

Calc I H – 2.1-2.2 Review 1 **Period**______

Find the derivative of the function. (#1 - #6)

1) $f(x)=3x^7+4x^5-2x^2$

$\boxed{f'(x)=21x^6+20x^4-4x}$

2) $y=3\sin x-4x^{\frac{2}{5}}$ $y'=3\cos x-\frac{8}{5}x^{-3/5}$

$\boxed{y'=3\cos x-\frac{8}{5x^{3/5}}}$

2) $f(x)=-7\cos x+\frac{5}{x^2}=-7\cos x+5x^{-2}$

$f'(x)=7\sin x-10x^{-3}$

$\boxed{f'(x)=7\sin x-\frac{10}{x^3}}$

4) $y=(3x-2)^2=9x^2-12x+4$

$\boxed{y'=18x-12}$

5) $f(x)=\frac{-1}{2\sqrt[3]{x^2}}=-\frac{1}{2}x^{-2/3}$

$f'(x)=\frac{1}{3}x^{-5/3}$

$\boxed{f'(x)=\frac{1}{3\sqrt[3]{x^5}}}$

6) $f(x)=(x^2+1)(3x-2)=3x^3-2x^2+3x-2$

$\boxed{f'(x)=9x^2-4x+3}$

7) a) Find an equation of the tangent line to $y=-2x^2+5$ at $x=-1$.

$f'(x)=-4x$

$f'(-1)=4$

$f(-1)=-2(-1)^2+5$

$=3$

$(-1,3)$ $m=4$

$\boxed{y-3=4(x+1)}$

b) Find the x-value where the slope of the tangent to the curve will be equal to 2.

$f'(x)=2$

$-4x=2$

$\boxed{x=-\frac{1}{2}}$

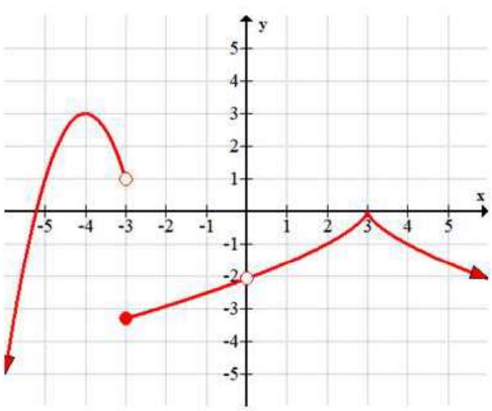
c) Find the x-value where the tangent to the curve will be horizontal. $m=0$

$f'(x)=0$

$-4x=0$

$\boxed{x=0}$

8) List the x-coordinate where the function is not differentiable and state the reason why.



$x=-3$ Jump Discontinuity

$x=0$ Hole Discontinuity

$x=3$ Cusp

9) A rock is thrown at an initial velocity of 39.2 meters per second from a 58.8 meter tall building. (Remember: $s(t) = -4.9t^2 + v_o t + h_o$)

a) The position function that will model the situation is:

$s(t) = -4.9t^2 + 39.2t + 58.8$

b) The velocity of the rock at 3 seconds is:

$v(t) = s'(t) = -9.8t + 39.2$ $\boxed{v(3) = 9.8 \frac{m}{s}}$

c) When does the rock reach its maximum height? $v(t) = 0$

$v(t) = -9.8t + 39.2 = 0$ $t = \frac{39.2}{9.8}$ $\boxed{t = 4s}$

d) What is the velocity of the rock when it hits the ground? $s(t) = 0$

$s(t) = \frac{-4.9t^2 + 39.2t + 58.8}{-4.9} = \frac{0}{-4.9}$ $t^2 - 8t - 12 = 0$

$t = \frac{8 \pm \sqrt{64 - 4(-12)}}{2} = \frac{8 \pm \sqrt{112}}{2}$ ~~$t = -1.292$~~ $\boxed{t = 9.292s}$

10) A rocket launched upward from the top of a building follows a path given by $s(t) = -4.9t^2 + 8t + 75$. m/s^2

a) Find the height of the building.

$s(0) = 75$ $\boxed{75 \text{ m}}$

b) When will the rocket hit the ground? $s(t) = 0$

$0 = -4.9t^2 + 8t + 75$ $t = \frac{-8 \pm \sqrt{8^2 - 4(-4.9)(75)}}{2(-4.9)} = \frac{-8 \pm \sqrt{1534}}{-9.8} = \boxed{4.813 \frac{m}{s}}$ ~~$= -3.180$~~

c) What time does the rocket reach its maximum height? $v(t) = 0$

$v(t) = -9.8t + 8 = 0$ $t = \frac{8}{9.8}$ $\boxed{t = .816 \text{ sec}}$

d) What is the maximum height the rocket reached?

$s(.816) = \boxed{78.265 \text{ m}}$

e) What was the initial velocity?

$v(0) = \boxed{8 \text{ m sec}}$

f) What is the velocity after 2 seconds?

$v(2) = \boxed{-11.6 \text{ m/s}}$

11) Use the limit definition of the derivative to find $g'(x)$: $g(x) = 5 - x + 2x^2$

$g'(x) = \lim_{h \to 0} \frac{5 - (x+h) + 2(x+h)^2 - (5 - x + 2x^2)}{h}$

$= \lim_{h \to 0} \frac{\cancel{5} \cancel{-x} - h + \cancel{2x^2} + 4xh + 2h^2 \cancel{-5} \cancel{+x} \cancel{-2x^2}}{h}$

$= \lim_{h \to 0} \frac{\cancel{h}(-1 + 4x + 2h)}{\cancel{h}}$

$g'(x) = \lim_{h \to 0} (-1 + 4x + 2h)$

$\boxed{g'(x) = -1 + 4x}$