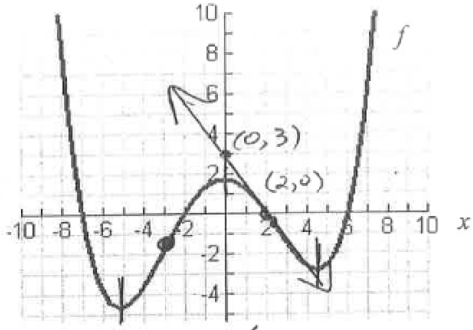
Math 4 Honors
Quiz Review: Lessons 6-3 thru 6-5

Name Hein 1 2015
Date

NO CALCULATOR!

1. Refer to the graph of f shown at the right.

Estimate to the nearest 10^{th}.



a. For what values of x is the derivative of f positive?

$(-5, 0) \quad (4.5, \infty)$

b. For what values of x is the derivative of f negative?

$(-\infty, -5) \quad (0, 4.5)$

c. For what values of x is the derivative equal to zero?

$x = -5, 0, 4.5$

d. Using a straightedge, draw the line that is tangent to the graph at $x = 2$. ✓

e. Estimate the derivative of the function when $x = 2$.

slope of T.L. $\approx -\frac{3}{2}$

f. ~~Find~~ Estimate the point(s) of inflection.

$(-3, -1.5) \quad (2.25, -.5)$

g. Determine the concavity of f.

Concave ↑: $(-\infty, -3) \quad (2.25, \infty)$

Concave ↓: $(-3, 2.25)$

2. **Sample A.P. Exam questions:**

a. $f'(x) = x^3(x-2)^4(x-3)^2$. $f(x)$ has a relative maximum at $x =$ ______.

(A) 0 (B) 2 (C) 2 and 3 (D) 0 and 3 (E) There is no relative maximum.

x^3	−	+	+	+
$(x-2)^4$	+	+	+	+
$(x-3)^2$	+	+	+	+
	−	+	+	+

0 2 3

Min

b. $f(x) = 2x^3 - 6x^2 + 6x - 1$ has a point of inflection located at ______.

(A) (0, -1) (B) (1, 1) (C) (2, 3) (D) (1, 0) (E) (-1, 1)

$f'(x) = 6x^2 - 12x + 6$

$f''(x) = 12x - 12$

$x = 1$

$f(1) = 2 \cdot 1 - 6 \cdot 1 + 6 - 1$
$= 2 - 6 + 6 - 1 = 1$

c. Consider the function $f(x) = x^4 + 2x^2 + 1$. On what interval is $f(x)$ increasing?

(A) $(-\infty, \infty)$ (B) $(-\infty, 0)$ (C) $(0, \infty)$ (D) $(1, \infty)$ (E) $(-\infty, 1)$

$f'(x) = 4x^3 + 4x$

$4x^3 + 4x = 0$

$4x(x^2 + 1) = 0$

$x = 0$

$4x$	−	+
x^2+1	+	+
	−	+

0

OVER →

2. Differentiate the following. *For c & d, write your answers in radical form.*

a. $y = 5x^3 - 4x^2 + 2x - 6$

$y' = 15x^2 - 8x + 2$

b. $y = 5x^2 - \frac{3}{x^3}$

$y' = 10x + 9x^{-4}$

c. $y = \sqrt[4]{x} + \sqrt[3]{x}$

$y' = \frac{1}{4}\sqrt[4]{x^{-3}} + \frac{1}{3}\sqrt[3]{x^{-2}}$

d. $y = \frac{1}{\sqrt{x}}$

$y' = -\frac{1}{2}\sqrt{x^{-3}}$

e. $f(x) = -3x^{-1} + 8x^{-2} + 9$

$f'(x) = 3x^{-2} - 16x^{-3}$

f. $f(x) = 10{,}126$

$f'(x) = 0$

g. $f(x) = 10{,}126x - 25$

$f'(x) = 10{,}126$

h. $f(x) = \frac{2}{3}x^3 + 5x^2 - \frac{1}{4}x + 13 - \frac{3}{5}x^{-1}$

$f'(x) = 2x^2 + 10x - \frac{1}{4} + \frac{3}{5}x^{-2}$

4. A particle moves on the x-axis such that its position at time t is given by the function

$$s(t) = t^3 - 9t^2 + 15t, \quad 0 \le t \le 6$$

a. Determine the velocity & acceleration of the particle at time t.
b. For what values of t is the particle at rest?
c. For what values of t is the particle moving to the right?
d. For what values of t is the particle moving to the left?
e. What is the total distance it has traveled after 5 seconds?
f. What is the velocity when the acceleration is zero?

a. $v(t) = 3t^2 - 18t + 15$
$a(t) = 6t - 18$

b. $0 = 3t^2 - 18t + 15$
$0 = t^2 - 6t + 5$
$(t-5)(t-1)$
$t = 5 \quad t = 1$

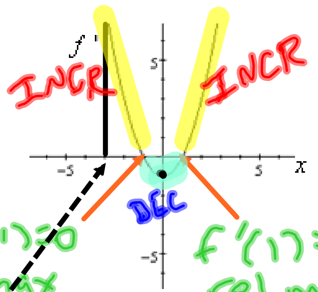
c & d
$t-5$: $-$ | $-$ | $+$
$t-1$: $-$ | $+$ | $+$
$+$ 1 $-$ 5 $+$

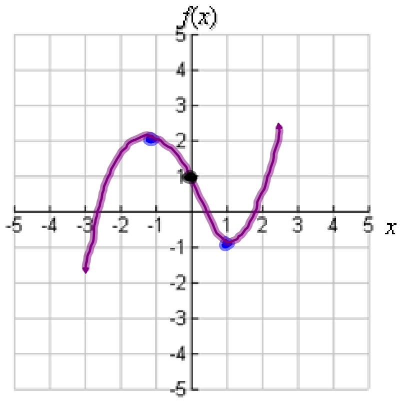
Right: $[0,1) \cup (5,6]$
Left: $(1,5)$

e. $s(0) = 0$
$s(1) = 7$
$s(5) = -25$
$7 + 7 + 25 = \boxed{39}$
$-25 \quad 0 \quad 7$

f. $0 = 6t - 18$
$t = 3$
$\boxed{v(3) = -12}$

5. The graph below is of $f'(x)$, the first derivative.
This is not the graph of $f(x)$. If $f(-1) = 2$ and
$f'(x)$ is represented by the given graph.
Graph $y = f(x)$ as best you can.





Suppose $f(-3) = -2$. What is the equation of the tangent line to the graph of $f(x)$ at the point $(-3, -2)$?

$f'(-3) = 7$; slope of T.L.!

$y = 7x + b$
$-2 = 7(-3) + b$
$-2 = -21 + b$
$b = 19$

$\boxed{y = 7x + 19}$