1. If $y = \frac{1}{3}x^3 + 2x^2 - 5x + 1$ has a relative maximum at $x = a$ and a relative minimum at $x = b$, then $a + 5b =$

(a) 0 ✓
(b) -1
(c) -2
(d) -3
(e) -4

$y' = x^2 + 4x - 5$
$= (x-1)(x+5)$

$y'' = 2x + 4$

$y''(1) = 6$ R min
$y''(-5) = -6$ R max

$b = 1;\ a = -5$
$-5 + 5(+1) = 0$

2. $\displaystyle\int \frac{8x^{9/5} - 4x^3 + x^2e^x}{x^2}\,dx =$

(a) $8x^{4/5} - 2x^2 + e^x + C$
(b) $10x^{4/5} - 2x^2 + e^x + C$
(c) $10x^{5/4} - 2x^2 + e^x + C$
(d) $10x^{4/5} - x^2 + e^x + C$
(e) $x^{4/5} - 2x^2 + e^x + C$

$\int 8x^{-\frac{1}{5}} - 4x + e^x\,dx$

$8\frac{x^{4/5}}{\frac{4}{5}} - 4\frac{x^2}{2} + e^x + c$

$\frac{40}{4}x^{4/5} - 2x^2 + e^x + c$

3. The function $f(x) = \dfrac{10x^2 + 9x + 5}{5x + 2}$ has an ~~oblique~~ asymptote given by

non vertical

(a) $y = 2x + 1$
(b) $y = x + 1$
(c) $y = 2x$
(d) $y = -2x + 1$
(e) $y = 2x - 5$

$2x + 1$
$5x+2 \,)\, 10x^2 + 9x + 5$
$10x^2 + 4x$
$5x + 5$
$5x + 2$
3

4. The graph of $f(x) = x^3 - 6x^2 + 9x$ is concave up on

(a) $(-\infty, 2)$

(b) $(0, 2)$

(c) $(2, \infty)$

(d) $(1, 2)$

(e) $(-2, 2)$

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

$-$ $+$

0 2

$(2, \infty)$

5. The absolute minimum **value** of $f(x) = 3x^4 - x^6$ over $[-1, 2]$ is

(a) -6

(b) -43

(c) 3

(d) 4

(e) -16

x	$f(x)$
-1	2
0	0
$\sqrt{2}$	4
2	-16

$f' = 12x^3 - 6x^5 = 6x^3(2 - x^2)$

$0, \cancel{-\sqrt{2}}, \sqrt{2}$

6. If $f(x) = e^{x^2}$, then $f''(1)$ equals

(a) $4e$

(b) $2e$

(c) $6e$

(d) e

(e) $3e$

$f' = 2xe^{x^2}$ $\quad f'' = 2e^{x^2} + 2xe^{x^2}2x$

$= 2e^{x^2}[1 + 2x]$

$f''(1) = 2e(3) = 6e$

7. Using differentials, $e^{0.001}$ is approximately

(a) 1.01

(b) 0.01

(c) 1.1

(d) 1.001

(e) 0.001

$x_0 = 0$ $\quad dx = 0.001$ $\quad f(x) = e^x$

$e^{0.001} = f(0) + f'(0)\,dx$

$= 1 + 1(0.001)$

$= 1.001$

8. If $y' = -x^2 + 2x$ and $y(2) = 1$, then $y(1)$ equals

(a) $-\frac{1}{3}$

(b) $\frac{2}{3}$

(c) 1

(d) $\frac{1}{3}$

(e) 0

$\int -x^2+2x\,dx = -\frac{x^3}{3}+x^2+c =$

$y = -\frac{x^3}{3}+x^2+c$

$y(2) = -\frac{8}{3}+4+c = 1$

$c = 1-4+8/3 = -\frac{1}{3}$

$y(1) = -\frac{1}{3}+1-1/3 = 1/3$

9. The marginal revenue is $\frac{dr}{dq} = 275 - q - 0.3q^2$. Then the unit price when producing 10 units is

(a) 260

(b) 240

(c) 200

(d) 1260

(e) 2800

$r = \left[275q - \frac{q^2}{2} - 0.3\frac{q^3}{3}\right] + c$

unit price $275 - \frac{q}{2} - 0.01q^2$

$p = \frac{r}{q}\Big|_{q=10} = 275 - \frac{10}{2} - 0.1(100)$

$= 275-5-10 = 260$

10. If $y = x^{x^2+1}$, then $y' =$

(a) $x^{x^2+1}(x^2+1+2x^2\ln x)$

(b) $x^{x^2+1}(x^2+1+x\ln x)$

(c) $x^{x^2}(x^2+1+2x^2\ln x)$

(d) $x^{x^2+1}(x^2+2x\ln x)$

(e) $x^{x^2+1}(1+2x^2\ln x)$

$\frac{y'}{y} = \left((x^2+1)\ln x\right)'$

$y' = x^{x^2+1}\left(\frac{2x^2\ln x}{x} + \frac{x^2+1}{x}\right)$

$= x^{x^2+1}x^{-1}(2x^2\ln(x) + x^2+1$

$=$