Test 1 Mat 2601 (Test)

Question 1

$$\frac{d}{dt}\left(3t^{\frac{11}{3}}\right) = 11t^{\frac{8}{3}}$$

$$\frac{d}{dt}\left(-2t^{\frac{9}{4}}\right) = -\frac{9}{2}t^{\frac{5}{4}}$$

$$\frac{d}{dt}\left(-t^{\frac{1}{2}}\right) = -\frac{1}{2}t^{-\frac{1}{2}} \quad \text{OR} \quad \frac{-1}{2\sqrt{t}}$$

$$\frac{d}{dt}(4) = 0.$$

$$z' = 11t^{\frac{8}{3}} - \frac{9}{2}t^{\frac{5}{4}} - \frac{1}{2}t^{-\frac{1}{2}}$$

Question 2.

Absolute minimum: (10, -697)

absolute maximum: (-4, 115)

Question 3

$$y' = 4x^2(4x^5 - 13)^2(24x^5 - 13)$$

Question 4

(a) $1.24x - 0.4x^2$

(b) $\boxed{110}$ hundred dollars

$\boxed{8800}$ hundred dollars.

(c) ~~decreasing~~ More subscribers are attracted by decreasing prices.

(d) $\boxed{36}$ hundred dollars per hundred subscribers.

..., the revenue increases by $\boxed{36}(100) = \$3600$.

✓ The revenue can be increased by lowering the monthly charges.

Question 5

Relative maxima: $(x, y) = (-1, 7)$

Relative minima: $(x, y) = (1, 3)$

(b) $x = -1, 1$

(c) $(-1, 7)$ - (smallest x-value)

$(1, 3)$ (largest x-value)

Question 6.

$$\frac{\frac{1-q}{q^{\frac{3}{4}}} + 4\sqrt[4]{q}}{(1-q)^2}$$

Question 7

$$\frac{x+3}{\sqrt{x^2+6x}}$$

Question 8

(a) $\lim_{x \to c} f(x) = 10$

(b) DNE

Question 9

$$y' = (x^2+x+3)\left(\frac{1}{3x^{\frac{2}{3}}} - \frac{1}{x^{\frac{1}{2}}}\right) + \left(\sqrt[3]{x} - 2\sqrt{x} + 7\right)(2x+1)$$

Question 10

(a) $f'(x) = 8x - 3$.

(b) -11

(c) -11

(d) $(-1, 7)$

Question 11

$y = 5x - 26$.

Question 12

360 ft.

Question 13

(a) $x =$ 2600 hammers.

Maximum Revenue:
$ 67600

(b) $ 42,000

Question 14

~~480~~ ft/sec.
480

Question 15

$f(-4) =$ DNE

$\lim_{x \to -4} f(x) = 9/4$

Question 16

$$2t(4t-9)^{1/4} + t^2(4t-9)^{-3/4}$$

Question 17

Horizontal asymptote: $y = 9$

Vertical asymptote: $x = 6$.

Question 18

$g'(x) = 12x^3 - 15x^2 + 13$.

$g''(x) = 36x^2 - 30x$.

$g''(3) = 234$

$g''(1/3) = -6$.

(a) ~~Concave up~~
$x = 3$: concave up

(b) $x = 1/3$: concave down.

Question 19

(a) $x = -3$:
Ans: concave down.

(b) $x = 8$
Ans: Concave up.

Question 20.

$$y'' = 10 + \frac{6}{25} x^{-\frac{8}{5}}.$$